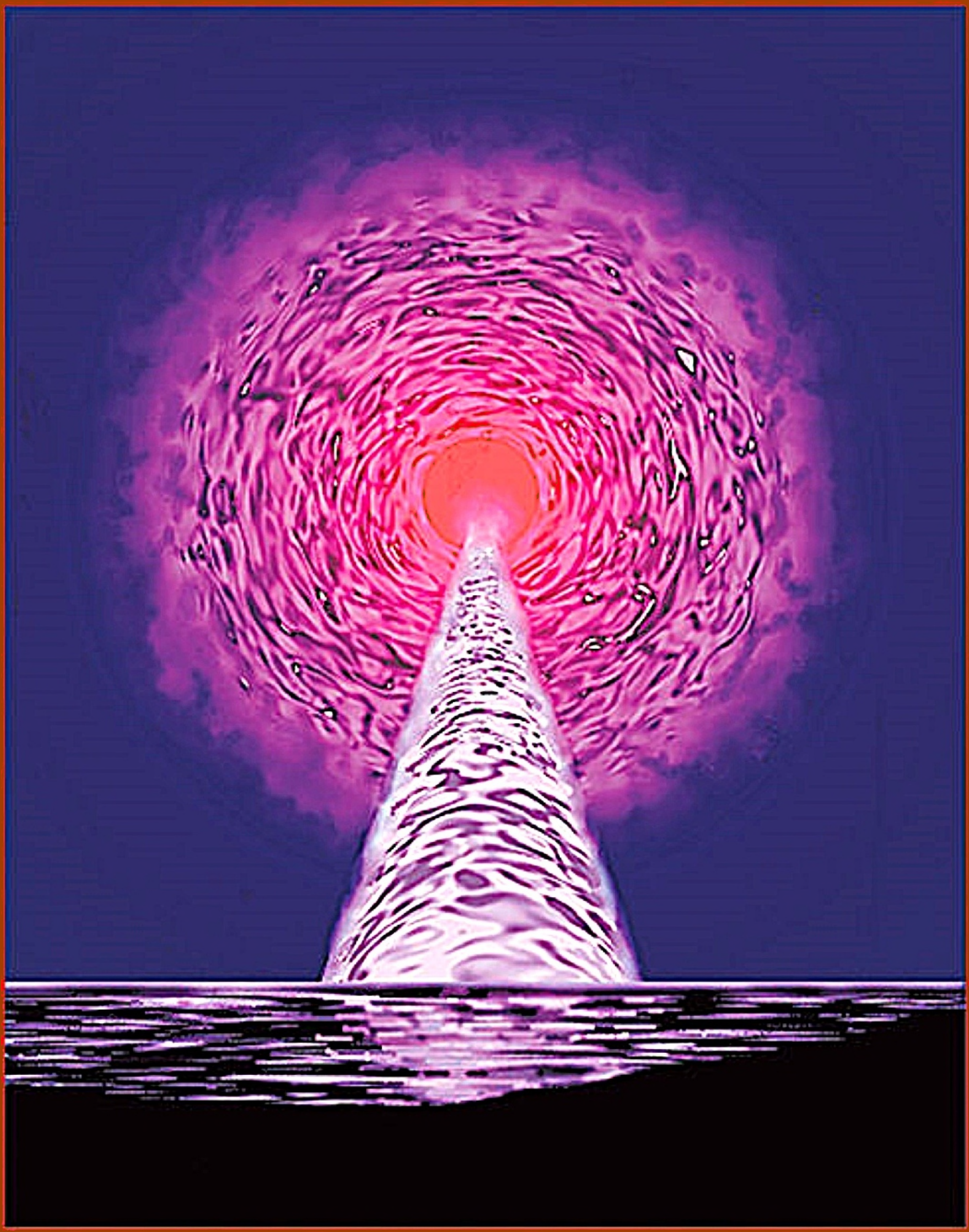
PRIMORDIAL STAR



DWARDU CARDONA

Primordial Star

Dwardu Cardona

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By the same author:

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(2006)

"Once I had *God Star* in my hands I could scarcely put it down. This is the most complete and articulate book on the topic I have read. It is a complete history...of the nature of an intense plasma occurrence in the Solar System as it once was at a time when mankind was present to record it...*God Star* delineates mythology from fable, setting the former as a true field of scientific enquiry. From *God Star* springs forth topic after topic on the physical conditions and processes our planet has undergone..."

Anthony L. Peratt, B.S.E.E., M.S.E.E., Ph.D
(Former Scientific Advisor, United States Department of Energy)

Flare Star
(2007)

"*Flare Star* is essential reading for anyone interested in geology, archaeology, paleontology, and/or the recent history of the Solar System. Cardona correlates information from astronomers, geologists, plasma scientists, and from comparative mythologists to demonstrate that they use different methods but come to many similar conclusions. He notes several known problems in science that are not often stressed outside the scientific community and then provides possible explanations to said problems with one basic assumption concerning the original plasma environment around Earth...Although Cardona's *God Star* was first in the series...a reader would not be lost starting with *Flare Star*. They compliment each other and both are very important books."

C. J. Ransom, Ph.D
(Plasma Physicist, University of Texas at Austin)

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And especially:

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and

Frederic B. Jueneman for helping the author dissolve the murky fog that had beclouded the discussion of the very same auroral ovals.

Even so, other than as specified above and in the text itself, I burden no one with each and every single facet of the hypotheses presented in this work.

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PART ONE

IN THE BEGINNING

Chapter 1

Ab Origine

PLANET FORMATION

The Quiché Maya of Guatemala were of the belief that Earth's original sun is no longer in the sky. "The sun that shows itself," they claimed, "is not the real sun."[1] They were not wrong. As strange as it may sound to those who have not read our previous volumes on the subject,[2] our present Sun is not the same sun which bathed Earth in primordial times. It therefore follows that the geological history of our world as presently taught cannot be entirely correct. Neither can the history of our Solar System. One need not even accept the above hypothesis in order to recognize the truth of this. Astrophysicists themselves have been harping on this reality for years. It has, for instance, been admitted that it's no longer known how planets manage to form. Discoveries that have come to light while this book was being written have shown that "the planet-building process is far wilder, messier, and more varied than anyone expected."[3] According to the astrophysicist Adam Frank: "The truth is that astronomers still do not know much about the origin of planets" and that, when compared to extra-solar systems, ours "is something of an oddball."[4] More than that, where planets were once thought to take millions of years to develop, it has now been calculated that extra-solar planets could "have formed no more than a few hundred thousand years ago."[5] Bodies the size of Jupiter, it has been claimed, can "pull together in just a few *hundred* years."[6] Under certain conditions, they can "possibly" even form "in a single human lifetime."[7]

The unfortunate part about all this is that the above conclusions have been based on the belief that planets accrete out of the debris contained in circumstellar disks, which disks are often thus referred to as accretion disks. But that planets cannot form in this manner has been admitted by quite a few authorities.[8] Objections to the theory had been voiced as early as 1960 by the then Astronomer Royal of Great Britain, W. H. McCrea. Calculations had shown him that it is impossible for the terrestrial planets—that is, Mars, Earth, Venus, and Mercury—to have formed where they are presently found inside the orbit of Jupiter. This applied to both

[1] D. Tedlock, *Popul Vuh* (N. Y., 1985), p. 182.

[2] D. Cardona, *God Star* (Victoria, British Columbia, 2006), henceforth merely *God Star*; *idem.*, *Flare Star* (Victoria, British Columbia, 2007), henceforth merely *Flare Star.*

[3] A. Frank, "How Nature Builds a Planet," *Discover* (July 2005), p. 30.

[4] *Ibid.*

[5] *Ibid.*, p. 34.

[6] *Ibid.*, p. 30 (emphasis added).

[7] *Ibid.*, p. 31.

[8] *God Star*, pp. 469-471; *Flare Star*, pp. 255-256.

the nebular and tidal theories of planet formation since, in either scheme, had these planets really formed between the Sun and Jupiter, they would have been pulled apart by tidal forces.[1]

Although, at the time, McCrea's views were hardly heeded, other voices were soon to join his. Thus, in 1979, J. H. Hoffman could state outright that "we've got to rethink the whole formation theories of the inner planets of the Solar System."[2] And, by 1996 it was announced that data from "mass spectrometer [interpretations] indicate that several elements, including carbon, oxygen, and sulfur, have abundances closer to solar values than previously thought,"[3] which suggested that "scientists don't fully understand how the planets evolved."[4]

A bigger problem concerns the formation of the giant gas planets. At their distances, the density of the small planetesimals that must have formed first in the solar circumstellar disk would have been too sparse to permit further accretion into full bodied gas giants.[5] Calculations centered on extra-solar giant planets add to the confusion since the tight orbits around their primaries are known to "defy conventional planet-formation theories,"[6] whether through disk-involved gravitational instability or core accretion. The core accretion model itself, Frank tells us, "is rife with uncertainties" and all such "theories and their impressive-looking conclusions are only as good as the assumptions built into them."[7]

Uncertainties aside, the fallacy of the theory is more than evident since planets are known to orbit stars that are still surrounded by the very disks from which the planets are supposed to have been formed.[8] Moreover, in some cases, the accretion of giant gaseous planets from disk debris would have taken longer than the entire existence of the systems in which these planets orbit. As it was discovered by 2003, the circumstellar disks of stars which roughly contain the same mass as our Sun seem to blow away in what has been theorized as "less than 10 million years and perhaps just 3 million years." Ninety percent of these stars have been calculated to have lost their disks "6 million years after their birth." Orthodox theory, however, demands a longer time for the formation of planets as massive as Jupiter through accretion from such disks.[9] This is exemplified by the red dwarf star known as Gliese 876 which, as Gregory Laughlin cautioned, "provides a warning that theories of planet formation are still lacking important elements."[10] Known to boast at least two massive planets and a much smaller Earth-mass body, Gliese 876 can claim the status of a miniature solar system. "It is hard to see," states Laughlin, "how a single gas giant, much less two, could form through the core-accretion process within the short lifetime of what was presumably a low-mass protostellar disk that accompanied the birth of Gliese 876."[11]

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[1] W. H. McCrea, *Proceedings of the Royal Astrononomical Society* AV 256 (May 31, 1960).

[2] J. H. Hoffman in the *Dallas Morning News* (December 11, 1979).

[3] *Science News* (January 27, 1996), p. 55.

[4] *Ibid.*

[5] B. Hills.*Origins: Cosmology. Evolution & Creation* (Cambridge, 2003), p. 87.

[6] G. W. Marcy, "The New Search for Distant Planets," *Astronomy* (October 2006), p. 32.

[7] A. Frank, *loc. cit.*

[8] *Ibid.*, p. 35.

[9] D. Tytell, "Planet-Forming Paradox Solved?" *Sky & Telescope* (September 2003), pp. 16-17.

[10] G. P. Laughlin, "Extrasolar Planetary Systems," *American Scientist* (September-October 2006), p. 427.

[11] *Ibid.*

Jeff Bary and David Weintraub then came to the rescue. As with black holes, dark matter, and dark energy, they appealed to dark accretion disks. According to them, those stars which appear to have already lost their disks "actually [still] have them; they've just turned invisible."[1] It is amazing how often it happens that when what is visible contradicts sanctified theory, astronomers end up appealing to the invisible. Alan Boss, on the other hand, favors faster planet formation through gravitational instabilities in gaseous protoplanetary disks, as they are sometimes called. This theory, of his own devising, would naturally shorten the necessary time required for Jovian planets to accrete. As we noted in our previous volume,[2] however, a computer model of his own creation failed to comply with his theory. This led Nuno Santos to reject Boss' procedure in favor of the older, but slightly modified, model. Basing his scenario on the heavy metallicity of exoplanet host stars, Santos and his colleagues have reasoned that protoplanetary disks should be heavily laden with metallic constituents. Thus, or so they claim, "solid planetary cores are more likely to form before the disk dissipates."[3] But neither of these theories can account for the formation of the massive gas planets at the distance in which they presently orbit.

There are other problems. Venus and Pluto, for example, rotate retrogradely. Triton, Neptune's largest satellite, travels around the planet in a retrograde orbit. So do the outer four moons of Jupiter. Brian Hills readily recognized that this is not easily explainable through accretion from a nebular disk that rotated around the Sun in one direction.[4] And, as if all that is not enough, there is the angular momentum of the so-called accretion disk to take into account.

> "A slowly rotating gas cloud will spin faster and faster as it contracts under gravity because angular momentum is being conserved. Eventually the spinning speed will be so great that it would prevent further gravitational contraction. The problem with the solar system is the peculiar distribution of the angular momentum. The sun is the most massive central object and has contracted the most, yet it only has about 2% of the solar system['s] angular momentum. In contrast Jupiter has 70%. How did the angular momentum get transferred from the sun to the planets?"[5]

It has even been suggested that "stars more massive than the Sun form planets in a different manner *than* the Sun."[6]

FURTHER PROBLEMS WITH CIRCUMSTELLAR DISKS

What is disconcerting is that while new discoveries are often hailed as ground-breaking news, they tend to be ignored by those whose ground is being broken. Thus while astrophysicists continue to speak out against the theory of planetary accretion from circumstellar disks,

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[1] D. Tytell, *op. cit.*, p. 17.

[2] *Flare Star*, p. 256.

[3] G. Schilling, "Metals Hint at How Planets Form," *Sky & Telescope* (September 2003), p. 23.

[4] B. Hills, *op. cit.*, p. 86.

[5] *Ibid.*, p. 87.

[6] K. Croswell, "A Giant Surprise," *Astronomy* (January 2006), p. 30 (emphasis added).

others seem to revel in reiterating it[1]—as Gino Segrè saw fit to do in the very "Introduction" to one of his major works.[2] Not only do most of them keep repeating the old dictum which presents these disks as the source of planetary genesis as if it was a proven fact,[3] they even go to the extent of presenting it as a solution to related problems.[4]

Not only planets, but even their satellites are believed by the majority of astronomers to have come into being through the accretion of matter that was once contained in the disks of debris that must originally have also circled the newly-forming planets.[5] Granted that, as always, some theoreticians keep voicing the usual cautionary counsels, most of them feel confident in shrugging off the caveats.[6]

But then—go figure, I might as well say it right now—astronomers have reported signs of collisions between planetesimals in circumstellar disks around young stars. (Notice—this time they are referred to as circumstellar, rather than accretion, disks.) These collisions, or so we've been assured, end up generating "huge amount of very fine dust, which eventually gets blown out of the system by stellar radiation pressure."[7]

But if that is the case, how can it also be assumed that the collision of dust particles in the same type of disks tend to continuously adhere to each other until boulders are formed, which boulders then continue to accrete into planetesimals, which can then aggregate into planets? Can they really have their cake and eat it too?

Apparently they can.

Take the Karin cluster of asteroids which, as of the end of 2007, numbered 90 members. Having had their orbits traced backward, 39 of them converged onto one spot thus indicating

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[1] G. W. Marcy, *op. cit.*, pp. 34, 35; K. Than, "Death Spiral: Why Theorists Can't Make Solar Systems," *Space.com* (March 28, 2006).

[2] G. Segrè, *A Matter of Degrees* (N. Y., 2002), p. xvii, but see also p. 166.

[3] See, for instance, O. Blaes, "A Universe of Disks," *Scientific American* (October 2004), pp. 50, 52; J. Roth, "A New Chapter in the Life Story of Planets?" *Sky & Telescope* (March 2005), p. 22.; *idem*, "Debris Disks on Display," in *loc. cit.*; A. E. Rubin, "What Heated the Asteroids?" *Scientific American* (May 2005), p. 82.; S. Clark, "The Search for Alien Technology," *BBC Focus* (Autumn 2005), p. 48; R. Villard, "The Search for Diamond Worlds," *Astronomy* (November 2005), p. 43; P. Taylor, "A Tenth Planet?" *Sky News* (November/December 2005), p. 18; S. Mohanty & R. Jayawardhana, "The Mystery of Brown Dwarf Origins," *Scientific American* (January 2006), pp. 40, 43; D. Jewitt, *et al.*, "The Strangest Satellites in the Solar System," *Scientific American* (August 2006), p. 42; M. R. Zapatero Osorio, "Planets Without Suns," *Astronomy* (October 2006), p. 46; R. Villard, "Does Life Exist on this Exoplanet?" *Astronomy* (December 2007), pp. 45-47; S. Soter, "Are Planetary Systems Filled to Capacity?" *American Scientist* (September-October 2007), pp. 414, 419; J. Trefil, "Earth's Fiery Start," *Astronomy* (December 2007), pp. 32 ff. (and A. Boss' answer to a reader's question, "Orbital Plane," in "Ask Astro," *ibid.*, p. 88).

[4] See here "NASA Scientist Finds World With Triple Sunsets," *Chronology & Catastrophism Workshop* (2005:3), p. 31; "Rapid-Born Planets," in *ibid.*, p. 33; S. R. Taylor & S. M. McLennan, "The Evolution of Continental Crust," *Scientific American* (September 26, 2005, Special Edition—*Our Ever Changing Earth*), p. 48; and Matthew Hedman's assertion in C. O. Choi, "Mounting Mysteries at Saturn Keep Scientists Guessing," *Space.com* (August 27, 2007).

[5] R. Villard, "Are Pluto and Earth Two of a Kind?" *Astronomy* (June 2006), p. 50.

[6] D. Mosher, "Planet Formation Mystery Solved," *Space.com* (August 29, 2007).

[7] D. Shiga, "Disk Demolition Derby," *Sky & Telescope* (April 2005), p. 24.

that when cosmic rocks crash into other cosmic rocks, they do not accrete into bigger cosmic rocks. They are, on the contrary, shattered into smaller cosmic rocks.[1]

> "Asteroid families are remnants of larger parent asteroids broken apart in collisions with other asteroids millions to billions of years ago."[2]

It is not that I hold much store in the retrocalculation of orbits,[3] so that I do not necessarily accept the above theorized origin of this particular asteroid group. But notice how the same authority, the planetary scientist Daniel Durda, also claims that other asteroids "are rubble piles that have coalesced due to gravity's attractive force, rather than solid, coherent fragments."[4]

Meanwhile, some of these circumstellar disks have been found to be "soaked with a 'steamy rain' of water vapor." This water has been said to "later freeze" to form "asteroids and comets."[5] Never mind that the icy nature of comets, as theorized by Fred Whipple in 1950, has never been verified. In fact, the theory has more recently come under severe attack. Forget cometary ice or snow, not even water was detected when Deep Impact crashed into Comet Tempel 1, as neither was it detected when Comet Linear disintegrated into a pile of rubble.[6] Worse than that, it was found that the particles collected from Comet Wild 2 by the Stardust spacecraft could only have formed in thousand-degree temperatures.[7] And the nucleus of Comet Borrelly was actually found to be quite hot.[8] None of which has stopped authorities from continuing to describe comets as "dirty snowballs."[9]

THE PLASMA EJECTION MODEL

Halton Arp, who has rightly been called the Galileo of the twentieth century,[10] is just as resolute when it comes to criticizing the formation of planets through accretion from solar disk debris.[11] He has long alternatively theorized that "proto-bodies are ejected from previously existing parent bodies and subsequently grow to their presently observed size."[12] Large galaxies thus eject smaller galaxies,[13] which in turn eject proto-stars.[1] Moreover, these

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[1] D. D. Durda, "Family Ties Reveal Asteroid Origins," *Astronomy* (October 2007), p. 38.

[2] *Ibid.*, p. 40

[3] See here *God Star*, pp. 184-186.

[4] D. D. Durda, *op. cit.*, p. 42.

[5] D. Mosher, "Star System Soaked With 'Rain'," *Space.com* (August 29, 2007).

[6] W. Thornhill & D. Talbott, *The Electric Universe* (Portland, Oregon, 2007), pp. 115, 116.

[7] *Ibid.*, p. 98.

[8] *Ibid.*, pp. 94-95.

[9] See here, for instance, A. Lawler, "What to do Before the Asteroid Strikes," *Discover* (November 2007), p. 63; C. O. Choi, "The Enduring Mysteries of Comets," *Space.com* (December 24, 2007).

[10] A. Acheson, "Halton arp: A Modern-Day Galileo," *AEON* VI:3 (November 2002), pp. 7-27.

[11] H. Arp, *Seeing Red: Redshifts, Cosmology and Academic Science* (Montreal, 1988), p. 222.

[12] *Ibid.*

[13] See *God Star*, pp. 471 ff. and *Flare Star*, pp. 256-257, where additional evidence is supplied in both works.

ejections can transpire laterally as well as poleward, which led Arp to ask: "Does the same mechanism evident in the formation of these young stars extend to the formation of planets?"[2] That question he then answered in a private communiqué addressed to this author in which he admitted that he, personally, considers "the outrageous possibility that planets originate in such fashion also."[3] While Arp's caution on this issue is noted, the theory that planets *are* born in this manner is now being seriously considered by other authorities. As Brian Hills recently wrote:

> "In complete contrast to the condensation model based on attractive gravitational forces, the plasma model proposes that planetary systems are created by the ejection of plasma out of a protosun. There is considerable observational support for this idea. Images of T Tauri stars, which are believed to be young (proto)-stars in the process of formation, show the ejection of thin plasma jets out of the proto-star and blob-like protoplanetary condensations along their length."[4]

Further optical evidence of poleward ejection comes from a star in the environs of the Rosette Nebula. Dubbed Rosette HH1 (that is, Herbig Haro 1), it is seen to be ejecting a complex polar jet that is riddled with knots which have been compared to "bullets" of material being ejected from the parent body. The star itself is believed to be of very low mass and it has been theorized that it might yet evolve into "an isolated brown dwarf or planetary mass object."[5] It is also, however, probable that the "knots" strung out along the jet might themselves evolve into planets. In fact, chances are that Earth, too, originated in this manner—which would explain man's fond memory of that previous time when a different sun had hung immobile in heaven's north celestial pole.[6] That this earlier sun had been a sub-brown dwarf star which eventually devolved into the present planet Saturn has also been documented in our previous volumes.[7]

What must now be examined is whether there are any physical indications of the proto-Saturnian sun's immobile placement in Earth's north celestial pole throughout *all* of Earth's past ages. And because, needless to say, man has not been around for all that time, we cannot here appeal to the mytho-historical record as we did in our previous volumes. It will also not be possible in this work to render a detailed account of Earth's *entire* past history. All we can do is supply a few pointers and leave it to others to fill in the blanks.

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[1] H. Arp, "Open Problems in Cosmology," in E. Spedicato & A. Notarpietro (Eds.). *New Scenarios on the Evolution of the Solar System and Consequences on History of Earth and Man* (Bergamo, 2002), p. 143.

[2] *Idem*, *Seeing Red* (see ref. # 20), p. 223.

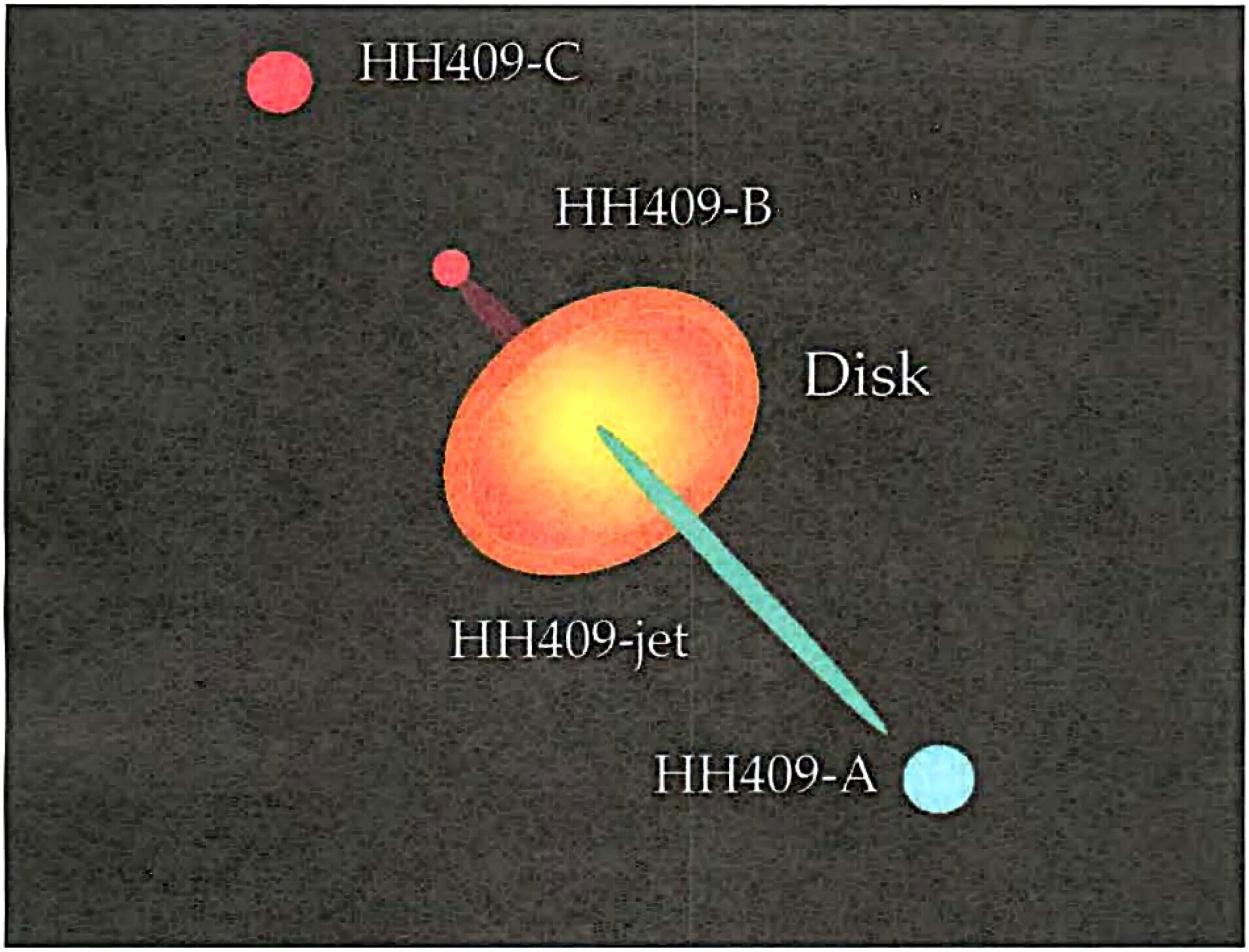
[3] *Idem* to D. Cardona, private e-mail message, October 23, 2000 (emphasis added).

[4] B. Hills, *op.cit.*, pp.92-93.

[5] "Fitful Young Star Sputters to Maturity in the Rosette Nebula," as lifted from the Internet and posted by W. Thornhill on the Intrsect electronic discussion group sponsored by KRONIA Communications.

[6] See here *God Star*, pp. 204 ff.; *Flare Star*, pp. 137 ff.

[7] *God Star*, pp. 120 ff., 343 ff.; *Flare Star*, pp. 146 ff.



Herbig Haro formation associated with the young planetary system HD 163296, showing the ejection of planetesimals along its bipolar jet.
(Illustration courtesy of NASA.)

EARTH'S PRIMORDIAL SUB-BROWN HOST

Earth had not only basked beneath the feebler rays of a different sun, but the proto-Saturnian system to which it belonged had originally been outside the demarcation of the present Sun's family of planets.[1] It may therefore be objected that such a foreign system could have actually invaded the Sun's domain.[2] That planets can, and do, move closer to their host stars is however proven by one such extrasolar planet—more than two hundred of which had been detected as of this writing[3]—which hasn't yet settled into a permanent orbit. It is moving toward its primary so fast that astronomers here on Earth can actually observe its motion.[4]

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[1] *God Star*, pp. 321 ff.

[2] But see also *Flare Star*, pp. 501-504.

[3] G. W. Marcy, *op. cit.*, pp. 31, 32; M. Turnbull, "Where is Life Hiding?" in *ibid.*, p. 62; J. Bryner, "Trickle of Planet Discoveries Becomes a Flood," *SPACE.com* (June 11, 2007); D. Overbye, "New Planets Astound Astronomers in Speed and Distance," *The New York Times* (October 5, 2006).

[4] "Weird Worlds," reported from *New Scientist* in *Chronology & Catastrophism Review* (2002:2), p. 44.

True, this is not the same as a planet moving into a star's system from outside it. And yet consider the Sagittarius dwarf galaxy which is presently merging with the Milky Way. Not only that, but stars that were originally gravitationally bound to the Sagittarius system may now be "in or near the solar neighborhood."[1] If a dwarf galaxy can invade the Sun's domain, what would be so difficult for a brown dwarf star to do the same?

Brown dwarf stars have been discovered far and near. They could be "nearly as numerous in our galaxy as sunlike stars,"[2] as many as 30 billion of them.[3] As of this writing, the nearest one is a companion of the naked-eye star known as Epsilon Indi. Dubbed Epsilon Indi B, and estimated to be from 40 to 60 times Jupiter's mass, it glows dimly red-hot at 1,000°C. Like the exoplanet mentioned above, it moves so fast that, in 2003, it garnered the record for the fastest motion known across the sky. A member of the spectral class T type, while not exactly our next-door neighbor, it is at a distance of 11.8 light years. Keep in mind, however, that the dwarf itself is only about 1,500 times distant from its companion as Earth is from the Sun, which, as astronomical distances go, is not all that much. Had Epsilon Indi been *our* primary, its brown dwarf companion would not have been too far away. Besides, as its discoverers have proclaimed, there is bound to be many of these class T type dwarfs still undiscovered that might even be closer to us.[4] It is therefore evident that there is nothing astronomically impossible in postulating that a sub-brown dwarf star system could have actually invaded the Sun's domain.

But could brown dwarf stars have their own planetary companions? As it happens, it was not long before the Epsilon Indi B brown dwarf mentioned above was found to have its own attendant. A sharp image of the pair was captured in August 2003 by Mark McCaughrean of Germany and his colleagues. The dwarf pair are now named Epsilon Indi Ba and Bb respectively. Rather than being a planet, however, the new companion is believed to be yet another, but somewhat fainter, class T type dwarf.[5]

With the demarcation between brown dwarf stars and giant gas planets becoming ever more blurred, what would be so impossible for a brown dwarf to be accompanied by a Jovian type planet, or, for that matter, one of lesser mass? And, in fact, have not such Earthlike planets attending brown dwarf stars been seriously considered by astronomers?

Some, of course, have claimed that "planets forming around a brown dwarf would be dark, frozen and lifeless."[6] To which Geoffrey Marcy, one of the, if not the, foremost extra-solar planet hunter, added that: "If the Earth was orbiting a brown dwarf, it would now be just 20 degrees above absolute zero."[7]

This, however, is a minority opinion, where the majority of authorities in this relatively new field tell a different story.

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[1] J. Roth, "Sagittarius Dwarf Galaxy Spans the Sky," *Sky & Telescope* (December 2003), p. 25.

[2] S. Mohanty & R. Jayawardhana, *op. cit.*, p. 40.

[3] G. Basri, "A Decade of Brown Dwarfs," *Sky & Telescope* (May 2005), p. 38.

[4] J. Roth, *loc. cit.*

[5] A. MacRobert, "A Well-Hidden New Neighbor," *Sky & Telescope* (December 2003), pp. 24-25.

[6] G. Schilling, "Chill-Out Zone," on *NewScientist.com* (June 1, 2002).

[7] *Ibid.*

True enough, brown dwarfs, which astronomers have termed "failed stars at best," are not massive enough to sustain the burning of hydrogen the way stars are believed to do. As Andrew Ackerman of NASA's Ames Research Center explained, "brown dwarfs appear as a faint glow, like an ember from a fire that gives off both heat and light energy as it dims." Even so, although "25,000 times fainter than the sun, brown dwarfs are still incredibly hot, with temperatures as high as 3,140 degrees Fahrenheit (2,000 Kelvin)."[1]

"What can we expect from a planet orbiting such a star?" asked Philip Plait.[2]

> "For one thing [he answered], it must huddle closer to its star to receive as much warmth as we enjoy here. To give the planet a more earthlike temperature, we'd have to drop it to just 6 million kilometers from the star's surface, or about one-tenth the distance of Mercury from the Sun. From this distance even the tiny red dwarf would look about five times bigger than the Sun in our sky."[3]

Could life be sustained on the surface of a planet orbiting such a dwarf sun? "Recent models indicate that relatively moderate climates could exist on Earth-sized planets in synchronous rotation around red dwarfs," according to Martin Heath and his colleagues.[4] "Investigation of the global water cycle, availability of photosynthetically active radiation in red dwarf sunlight, and the biological implications of stellar flares, suggest that higher plant habitability of red dwarf planets may be possible."[5]

But what about the slightly less massive *brown* dwarf stars?

> "It was once thought that life could exist on a brown dwarf owing to the warm conditions that would be prevalent. This idea has been discredited, but it has been acknowledged that life might be possible on a moon orbiting a brown dwarf. The moon would be warmed by gravitational tidal effects as well as the warmth emitted directly by the failed star itself."[6]

Where we differ from present opinion is in the placement of our posited sub-brown dwarf. In our case, with Earth's dwarf primary permanently located in the north celestial pole, the dwarf star's rays would have reached Earth's north pole vertically, thus ensuring a perpetual warmth within the regions of the Arctic Circle. And while the dwarf's rays would have been slanted enough to keep the more southerly latitudes somewhat cooler, the reflection of heat off

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[1] Reported on the Internet in "Astronomers Find Jupiter-Like Weather on Brown Dwarfs," *Science Daily* (May 27, 2002).

[2] P. Plait, "Under Alien Skies," *Astronomy* (January 2003), p. 40.

[3] *Ibid.*

[4] M. J. Heath, *et al.*, *Origins of Life and Evolution of the Biosphere*, Vol. 29, No. 4 (1999), pp. 405-424, as reported in "Habitability of Planets Around Red Dwarf Stars," *SIS Internet Digest* (2002:2), p. 3.

[5] *Ibid.*; see here also especially *God Star*, pp. 343-350.

[6] Reported in "The Extended Habitation Zone," *SIS Internet Digest* (2002:2), p. 3, where various sources are cited.

proto-Saturn's plasmaspheric shell[1] would have actually been able to keep all terrestrial latitudes warm enough for the inception and sustenance of life.[2]

Such plasmaspheric bubbles have been detected around extrasolar planetary systems. One planet, bearing the designation HD 209458b, is enclosed within what has been described as a "comet-like envelope" centered on its parent star in a huge "exosphere."[3] This is no different than the Sun-centered plasmaspheric envelope, referred to as the heliosphere, which encloses the planets of our Solar System. Plasmaspheres are quite often transparent, allowing various waves to pass unheeded through their boundaries. This, however, depends on the plasmasphere's frequency. If the plasma frequency is lower than that of the radiated wave, the wave will easily pass through the boundary. But if the plasma frequency is higher than that of the radiated wave, the wave will be bounced, or reflected, back from the interior surface of the plasmasphere's periphery[4]—which is very much what we claim to have been the manner through which proto-Saturn's heat reached all latitudes on Earth.

A DIMMER SUN

It has been surmised that "the infant sun" during Earth's early history "was only about 75 percent as bright [and therefore 75 percent as hot] as it is today."[5] The problems—not to say headaches—this supposition has caused scientists in different disciplines were best enumerated by Rick Boling,[6] but we need not go into all that here. Besides, this is a topic we had already covered in our first volume of this series[7] in which we were bold enough to claim that this "infant sun" was not the Sun which presently bestows its rays upon us, but, rather, the proto-Saturnian sun which formed the basis of that work as well as this. As a sub-brown dwarf star, proto-Saturn's dimness, when compared to our present Sun, would be in keeping with what seems to have been required by the characteristics of Earth's early life forms.

As we had also pointed out in that first volume, this lesser heat accounts for the spindly nature and sparse foliage of Earth's first land-based plants which give the impression that they had to struggle for whatever available dim light there was to nourish them. Even today, when plants are grown in an artificial environment that limits the incidence of infrared light, they compensate by elongating their stems at the expense of leaf expansion, through which flowering, and therefore seeding, is accelerated. In fact, it seems as if it was not until the age of mammals, predominantly during the Paleocene period, that Earth's land areas became engulfed in a verdant profusion of subtropical plants.[8]

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1 See here *God Star*, pp. 297 ff., 321, 340-341, 348, 349, 350, 381, 404, 491; *Flare Star*, pp. 42, 158-160, 257-258, 261-262, 268, 287, 372, 382, 385, 437, 474, 511-512.

2 For more on how Earth would have survived in company with the sub-brown dwarf star that was proto-Saturn see *God Star*, pp. 343-350.

3 S. Seager, "Unveiling Distant Worlds," *Sky & Telescope* (February 2006), pp. 31, 32.

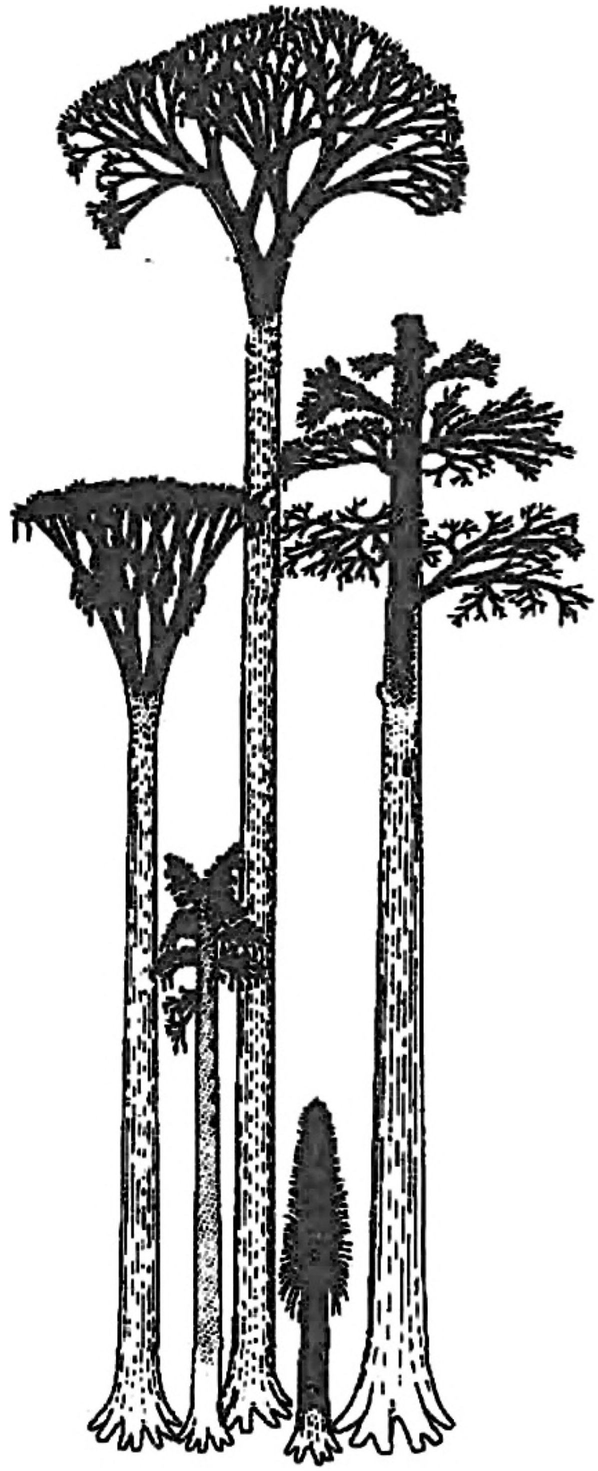
4 See here D. E. Scott, *The Electric Sky* (Portland, Oregon, 2006), p. 75.

5 S. M. Clifford, "The Iceball Next Door," *Sky & Telescope* (August 2003), p. 33

6 R. Boling, "The Faint Young Sun," *Earth* (June 1996), p. 11.

7 *God Star*, p. 295.

8 *Ibid.*, p. 297.



Lycopod trees, up to ninety feet tall, from Earth's primordial ages, indicate a straining of trunks in order to reach a feeble light stationed directly overhead.

The encouragement of plant growth through red light has even influenced NASA to design a red light-emitting diode "the emission of which packs 10 times the energy of the sun's at the same wavelength." Astronauts have additionally found that emission from this diode, "about the size of a pack of cards," helps cuts to heal faster by stimulating cellular mitochondria.[1]

One might wonder how proto-Saturn could have shed but little infrared light through the long geologic period that preceded the Paleocene, and then increase its infrared wavelength to excess. But if the present Sun is believed to have increased its radiation as it matured, there should be nothing to hinder a similar belief concerning the evolution of a sub-brown dwarf star. To be sure, there was more to it than simply that because, as we shall soon see, proto-Saturn's radiative output had not only been inconstant through the ages, but its changes in temperature were often sudden. Moreover, brown dwarfs are known to grow brighter as they *cool* through age.[2]

THE PROTO-SATURNIAN PRIMARY

That Earth's "primitive sun was fainter and contributed less energy" than it currently does continues to be preached by astrophysicists.[3] And yet, the absence of inert noble gases in Saturn's satellites indicates that the present Saturnian system must have been warm when it came into being.[4] This has led to the suggestion that "Saturn itself formed somewhere closer to the Sun than it is now"[5] from where it would have naturally wandered outward.

Likewise with Pluto. "According to the standard theory of how our solar system formed," Ker Than reported, "Pluto formed much closer to the sun but was then knocked out to its current orbit due to instability in the inner solar system."[6]

Not so with Jupiter. In direct opposition to Pluto and Saturn's satellites, Jupiter has more of these inert noble gases than it could have acquired in its present orbit or one closer to the Sun. Unlike Pluto and the Saturnian satellites, Jupiter must have formed *far away* from the Sun—some say somewhere in the Kuiper belt at the outer edge of the Solar System—from where it would have wandered *inward*.[7]

But that Jupiter could not have formed *within* the Kuiper belt is intimated by the scarcity of the very noble gases which proliferate on the planet. While temperatures are cold enough to allow the formation of such elements, their concentrations within the belt fall far short of satisfying the quantity in Jupiter's rich atmosphere.

What can be said for certain has already been said by Tobias Owen who then hailed from the University of Hawaii's Institute for Astronomy in that no matter what one posits, Jupiter's

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[1] C. Choi, "Seeing Red," *Scientific American* (May 2003), p. 33.

[2] R. Talcott, "First Forecast: Cloudy; No Rain," *Astronomy* (December 2002), p. 32.

[3] J. W. Valley, "A Cool Early Earth?" *Scientific American* (October 2005), p. 60; J. Trefil, *op. cit.*, p. 36.

[4] D. Tytell, "Understanding Titan's Terrain," *Sky & Telescope* (December 2005), p. 18.

[5] *Ibid.*

[6] K. Than, "Pluto-Sized planet Embryos Detected," *Space.com* (October1, 2007).

[7] R. R. Britt, "Jupiter's Composition Throws Planet-Formation Theories into Disarray," *Space.com* (November 17, 1999).

atmospheric composition throws planet-formation theories into disarray.[1] Or, as Thomas Donahue, who then worked for the Planetary Science Laboratory at the University of Michigan, put it: "There may be more to the solar system than we know about."[2] And yet, it has actually been reported with close to certainty that Jupiter was the first planet to form within the Solar System.[3]

What about Earth?

A dimmer Sun in the past, Gino Segré rightly noted, would have meant a cooler Earth. But if that was the case, Earth's oceans should have been frozen at a time when evidence strongly indicates that they were not.[4] Did Earth then also come into being closer to the Sun than it is now? Not according to Segré who has instead suggested what he believes to be "the most likely solution to the dilemma" in that terrestrial carbon dioxide levels "could have been" a thousand times higher than at present, and that these would have "kept the oceans from freezing."[5] "Could have been," however, is not enough to clinch the matter, and Segré was honest enough to admit it.

Never mind carbon dioxide—astronomers had originally burdened the Sun with a similar oxygen composition to that of its planetary family. It was also assumed to contain enriched levels of the oxygen-16 isotope. Samples from the Sun itself are not yet available for analysis, but part of its composition can actually be inferred from lunar samples. This is because the solar wind is able to implant oxygen isotopes on the airless surface of the Moon. But results obtained from isotopic analysis conducted on grains of lunar soil returned to Earth in 1969 not only indicate that the Sun is dissimilar to the Earth-Moon system, it also has lower levels of oxygen-16 than had been theorized. "This was a completely unexpected result," Trevor Ireland from the Australian National University confessed. "Our Sun is not the Sun that we though it was."[6]

Or is it that our Sun is not the sun we thought we always had?

At this point even astronomers should have asked: Was it the *Sun* that was different, or was there a *different* sun in the past? Because if the Sun's composition does not reflect that of its *entire* family, some of its planetary children might have been adopted.

What was established in 2004 is that the planet Saturn is very different from the planet Jupiter and that the both of them cannot be classed together simply as gas giants.[7] The manner in which Saturn dispatches its X-rays is entirely different from the manner in which Jupiter does.[8] Other differences involve the concentration of heavy elements in Saturn's massive core, while they are mixed and scattered throughout Jupiter's gaseous cover. Not only are the

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[1] *Ibid.*

[2] *Ibid.*

[3] G. Musser, "Essential Things to Do in Space," in G. Musser & S. Ashley, "The Future of Space Exploration," *Scientific American* (October 2007), p. 73.

[4] G. Segré, *A Matter of Degrees* (N. Y., 2002), p. 202.

[5] *Ibid.*

[6] "It's The Sun—But Not As We Know It," *ABC Science Online* (April 6, 2006).

[7] *New Scientist* (March 30, 2004), p. 19.

[8] *Ibid.*

two planets in question different, with different types of cores and atmospheres, they have obviously formed in radically different ways.[1]

Not so long ago, scientists had suspected that Saturn's heat can be explained by the impact of super-hot particles from the solar wind with the planet's magnetic field, thus exciting atoms in its atmosphere, much in the manner that auroras are created on Earth.[2] And when auroras were actually photographed at both Saturn's poles, the suspicion came close to being sanctified. But as Alan Aylward and his colleagues indicated, auroras have a tendency to cool, rather than heat, the upper atmospheres of the gas giants.[3] It was therefore decided that Saturn's extra heat could be explained by *gravity* waves—which they differentiate from *gravitational* ones—plus atmospheric oscillations in what they described as a "tug of war between the planet's gravity and the buoyancy of [its atmospheric] gas."[4] Or, as they also suggested, "Saturn's electric fields could be even more complex than before thought."[5] Aylward was quite honest when he confessed that they "don't even understand the details of the electric fields on Earth," let alone that of the distant planets.[6] Which brings me to the planetary theorist Sara Seager, from the Massachusetts Institute of Technology, who was also honest enough to admit that: "The whole of astronomy is built on not knowing anything."[7]

There's no such complicated mechanism in our scheme to account for Saturn's atmospheric warmth. It is not that Saturn formed closer to the Sun, but that it itself had formerly *been* a sun. This explains why it possesses an atmosphere that is "far hotter than can be explained by absorbed sunlight."[8]

In the meantime, Jupiter's above-mentioned anomalies will have to be postponed to their rightful chronological place in a future volume of this series.

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[1] J. Danneskiold, "Los Alamos Computers Probe How Giant Planets Formed," *Los Alamos News Letter* (August 16, 2004), p. 1.

[2] C. O. Choi, "Mounting Mysteries at Saturn Keep Scientists Guessing," *Space.com* (August 27, 2007).

[3] *Ibid.*

[4] *Ibid.*

[5] *Ibid.*

[6] *Ibid.*

[7] D. Overbye, "A Planet Too Hot for Life—But Another May be Just Right," *The New York Times* (June 12, 2007).

[8] C. O. Choi, *loc. cit.*

Chapter 2

Geogenesis

THE PRE-BIOTIC SOUP

Besides the aforementioned infrared, the origin of terrestrial life also required ultraviolet radiation—as it had been proposed in 1953 by Harold Urey. Although, at the time, Urey had insisted that Earth's early atmosphere would have consisted of methane, ammonia, hydrogen and water vapor, he ascribed the origin of life to lightning discharges or ultraviolet radiation. These, he had then reasoned, would have split the above compounds into free radicals which would then have recombined "in chance ways" to form more complex molecules.[1]

Axel Firsoff also touched upon the subject back in 1967:

> "Atmospheric electricity, ranging from silent discharges to lightning, involving potential differences of millions of volts, is undoubtedly to be expected on the primitive Earth and other planets. Yet...the actinic (ultra-violet) radiation of the Sun, unchecked by ozone, would be far more ubiquitous, reaching even the meteoric matter in space."[2]

Adenosine triphosphate—ATP for short—has been considered by J. B. S. Haldane as "the most lifelike molecule."[3] The interest here is that when a mixture of adenine, ribose, and a polyphosphate ester was exposed to ultraviolet rays, ATP was formed.[4]

> "Interesting in this context [Firsoff tells us] are the experiments in proto-cell generation made by the Indian scientists K. Bahadur, S. Ranghayaki and O. N. Perti. They exposed for prolonged periods to sunlight or an ultra-violet lamp sterilised solutions containing citric acid and a colloidal salt of molybdenum or iron, which resulted in the formation of large numbers of cell-like microstructures, christened by them '*jeewanu*', a Sanskrit word for 'particles of life'. Confirmatory experiments were carried out in England...by [M. H.] Briggs."[5]

"Whether or not we regard such *jeewanu* as living may be a matter of definition," Firsoff warns, "but it seems clear that similar structures must have been formed in the sea-soup, and their further evolution could have led to the emergence of the first unicellular organisms."[6]

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[1] "Genesis by Lightning," *Scientific American* (July 2003), p. 16.

[2] V. A. Firsoff, *Life, Mind and Galaxies* (London, 1967), p. 26.

[3] *Ibid.*, p. 21.

[4] *Ibid.*, p. 28.

[5] *Ibid.*, p. 38.

[6] *Ibid.*, p. 39.

ERA	PERIOD	EPOCH	M/Yrs Ago
CENOZOIC	Quaternary	Pleistocene	c. 1
	Tertiary	Pliocene Miocene Oligocene Eocene Paleocene	c. 13 c. 25 c. 36 c. 58 c. 63
MESOZOIC	Cretaceous	Upper Lower	c. 110 c. 135
	Jurassic	Upper Middle Lower	c. 165 c. 180
	Triassic	Upper Middle Lower	c. 200 c. 230
PALAEOZOIC	Permian	Upper Middle Lower	c. 260 c. 280
	Carboniferous	Pennsylvanian Mississippian	c. 320 c. 345
	Devonian	Upper Middle Lower	c. 365 c. 390 c. 405
	Silurian		c. 425
	Ordovician	Upper Middle Lower	c. 445 c. 500
	Cambrian	Upper Middle Lower	c. 530 c. 570

Simplified table of geologic succession.

This is also the conclusion of Clair Fulsome, who believes that the time preceding the first traces of life required energy—heat, radio-activity, electrical discharges, and ultraviolet radiation—in abundance.[1]

Beginning in 1975, Joel Levine who, in 1982, was honored with the Halpern Award in Photochemistry, developed a series of sophisticated computerized models which led him to investigate what was especially significant in Earth's atmosphere that could have led to the origin of life. Similar studies had been conducted before, as early as the 1920s, by the Russian biochemist A. I. Oparin and the British geneticist J. B. S. Haldane. According to their findings, organic compounds could only form in an atmosphere that would be rich in methane, ammonia, hydrogen, and water. Then, in 1952, Stanley Miller, at that time still a graduate student at the University of Chicago, was prompted by his mentor, the above-mentioned Harold Urey, to conduct what has now become his famous experiment. What Miller did was to subject a mixture of methane, ammonia, and hydrogen circulating through a flask of water to a continuous electric charge. A week later a reddish brown soup had formed at the bottom of the collection chamber which was found to contain several amino acids, the very precursors of living systems that had actually been predicted by Oparin. Thirty years later, Levine and Tommy Augustsson entered the constituents of this cosmic soup into their computer models only to discover that an atmosphere containing appreciable amounts of methane and ammonia would be chemically unstable and thus very short-lived. This would have been mainly due to the decomposing influence of ultraviolet radiation from the Sun. The cosmic soup which had so far been lauded as the cradle of life would have lasted less than one hundred years.[2]

"The overwhelming majority of chemical-evolution experiments since the first one," Levine insisted, "may have been conducted with the wrong atmospheric mixture." For starters, argued Levine, none of the experiments had included oxygen "which we believe was present in at least small quantities." But, most of all, "until recently no one was aware of the high levels of ultraviolet radiation that the young sun most probably emitted." But then, as he himself admitted, such high levels of ultraviolet "are lethal to living systems as we know them." All of which led him to ask: "How could life have formed and evolved in such a hostile environment?"[3]

THE ULTRAVIOLET ENVIRONMENT

Further work conducted by other researchers had already shown that, through volcanic emissions, Earth's early atmosphere would have been primarily composed of water vapor, carbon dioxide, and nitrogen. Laboratory experiments conducted by Levine and others in which this mixture was subjected to laboratory-induced lightning suggested that the mixture *can* yield the organic compounds so vital to life. The organic yield did prove to be a little less than that produced by the original experiments, but, as Levine reasoned, that only means that the life-producing process took a little longer.[4]

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[1] T. Palmer, in reviewing C. E. Fulsome's *The Origin of Life* in *S.I.S. Review* V:2 (1980/81), p. 61.

[2] P. Huyghe, "New Recipe for Cosmic Soup," *Science Digest* (May 1983), p. 44.

[3] *Ibid.*, p. 42.

[4] *Ibid.*, p. 44.

The major problem in Levine's model was the belief that Earth's early atmosphere would have contained little or no oxygen. At that point, the astrophysicist Vittorio Canuto came next on the scene by asking Levine how his model would be affected "by the possibility that the sun had, in its youth, emitted more UV than it does today." This was prompted by the discovery of young Sun-like stars which were found to emit high levels of ultraviolet radiation. The Sun, it was then concluded, may have emitted as much as 10,000 times more ultraviolet than it does at present. "When Levine inserted the increased UV values into his model, he found that the oxygen levels in the early atmosphere rose by a factor of about one million."[1]

But how could high levels of ultraviolet radiation have been beneficent to the origin of life when it is known to be *lethal* to living systems? Actually, as Levine himself had stressed, ultraviolet radiation is "lethal" only "to living systems *as we know them*."[2] Besides, as Firsoff also informs us, while ultraviolet rays are generally harmful, "many abiogenic syntheses or organic compounds are mediated by such ultra-violet radiation, so that the present biological allergy to it may date back to the transition from a reducing to an oxidising atmosphere, where the ozone layer cuts off the solar ultra-violet from the ground.'[3]

> "Chlorophyll, as its colour indicates, relies chiefly on the energy of the red part of the spectrum; but bacterial chlorophyll is characteristically purple and may assume other colorations, so that there is nothing sacrosanct about this. Moreover, hot-spring algae and many young leaves are red or orange, which seems to be an adaptation to a hot habitat, and may in the latter case, as A. G. Tikhov has suggested, be a kind of phylogenetic memory...of a time when the blue end of the spectrum was stronger in sunlight and was utilised for photosynthesis."[4]

Moreover:

> "...organisms may be able to parry the danger of actinic radiation by appropriate reflecting or absorbing surfaces. Indeed, such an adaptation exists in mountain lichens. Thus there is no definite reason to believe that life could not exist without a protective layer of ozone or other gases absorbing the ultra-violet rays of the Sun."[5]

Secondly, as we will indicate below, there is more than one form of ultraviolet radiation, *one of which is not really lethal to life.*

The point of all this is that if we theoretically shift Earth to the proto-Saturnian system proposed in this work, the high levels of ultraviolet radiation needed for the inception of life is amply met since it is known that brown dwarf stars emit highly in the ultraviolet spectrum of light.[6]

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[1] *Ibid.*

[2] Emphasis mine.

[3] V. A. Firsoff, *op. cit.*, p. 64.

[4] *Ibid.*

[5] *Ibid.*

[6] *God Star*, pp. 293, 482; *Flare Star*, pp. 148, 374, 429, 473-474.

In view of our posited placement of the proto-Saturnian sun in Earth's north celestial pole, it comes as no surprise that the earliest signs of life so far detected actually come from within the Arctic Circle—Akilia Island, West Greenland to be exact. First proposed by Mark Harrison and his colleagues in 1996, this conclusion came under severe attack down the years. This was predominantly because the evidence was circumstantial rather than direct. This evidence came from the study and tests conducted on micron-sized carbonaceous globules retrieved from marine sediments at Akilia Island rather than from recognizable microfossils. Harrison, however, has done an excellent job in rebutting the criticisms raised against the hypothesis and, as of this writing, his conclusions seem to hold.[1] Even so, controversial as this hypothesis remains at present, its refutation, if ever that comes to pass, will in no way depreciate from our main thesis.

So much for the origin of organic compounds. But how about life itself and its sustenance once it developed?

PHYLOGENETIC MEMORY

The ozone layer in Earth's atmosphere is unstable. Depletion of the layer occurred in the mid 1960s. Some had thought that this was due to atmospheric nuclear tests; others blamed it on a volcanic eruption in the southern hemisphere. This led to the belief that future studies on mosses in the Antarctic region might solve the problem since these plants produce certain compounds which enable them to protect themselves against ultraviolet radiation when this becomes higher than usual.[2] It is, however, doubtful that periodic fluctuations of short duration in the ozone layer would have permitted such plants to develop this ability. Might not one, instead, surmise that this ability had long been possessed by plants which would then enable them to survive periodic depletion of the ozone? Might not this ability be a phylogenetic memory from those early eras in Earth's history when plants would have developed this safeguard in an environment that was high in ultraviolet radiation?

This, then, would also apply to bacteria which also possess a repair mechanism against both X-rays and ultraviolet radiation.[3] Here, one cannot claim that X-rays filter through from the Sun during periods of ozone deficiency. On the other hand these are the very two radiative waves preponderant in brown dwarf stars.

There was a time, of course, when it was believed that since the early Earth contained but little oxygen, no ozone layer could have formed. This led to the deduction that whatever life existed at the time, mainly algae and bacteria, would have had to shelter itself from the Sun under the sea. The land, it was believed, could not have been inhabited "until enough protective ozone had accumulated," which event is usually stated to have been "about half a billion years ago." This all changed when the biologists Mitchell Rambler and Lynn Margulis ex-

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[1] M. Harrison, "In Search of Akilia's Heel: The Controversy Over the Earliest Evidence for Life on Earth," paper given at the seminar sponsored by the School of Earth Sciences at the Australian National University, September 25, 2003.

[2] *New Scientist* (November 24, 1990), p. 24.

[3] B. Lewin, *Gene Expression—1: Bacterial Genomes* (London, 1974), pp. 495 ff.

posed bacteria "to the maximum levels of ultraviolet radiation that similar organisms would have received in the earth's youth."[1] And their results?

> "Some of the bacteria proved to have not only high resistance to radiation, but also the ability to repair DNA damaged by ultraviolet light...These capabilities, say Rambler and Margulis, are legacies from ancestors that successfully faced the sun before a substantial ozone layer formed. Citing other ways that primitive organisms could have been protected from radiation, they conclude that the history of life on land may be as old as the history of life."[2]

Even so, all of the above still limits us to primitive organisms—algae, bacteria, and mosses—at the very inception of life on Earth. What, however, of those life-forms that came later at a time when the ozone layer is supposed to have finally formed?

INSECT EYES

Frank Lutz and E. N. Grisewood also conducted experiments. Their interest centered on the fruit fly, which has served as the guinea-pig in many an experiment. Using a mercury lamp which produced ultraviolet radiation with a wavelength of 2537 angstroms, they discovered that the fruit fly is responsive to it with a sensitivity comparable to their response to ordinary light. Further experiments with larger flies and even bees also proved that the outer part of their eyes is transparent to ultraviolet light of the same wavelength "which must, therefore, reach the inner eyes of these creatures." What this means is that these insects can actually detect ultraviolet radiation—which is not detectable by human eyes—and not to an indirect effect of it. "If this is true," Lutz and Grisewood concluded, "it has some interesting bearing on biological speculation in view of the fact that light of so short a wavelength does not and probably never did occur in the environment of insects."[3]

That being the case, why would these insects have developed this capability? Unlike butterflies and birds, which we shall discuss below, there would have been no evolutionary purpose for them to actually detect pure ultraviolet light. We cannot here resort to the ultraviolet radiation produced by the young Sun for the simple reason that, by the time insects evolved, Earth's atmosphere would have developed enough oxygen in order for these creatures to be able to survive. With enough oxygen, the ozone layer would have also already formed and this, in turn, would have shielded Earth from solar ultraviolet radiation. We'll keep in mind that Fred Hoyle and Chandra Wickramasinghe caution us to the fact that insects require very little oxygen.[4] But, even so, it is now surmised that, by the time insects evolved, Earth's atmosphere was already much the same as it is now.

Hoyle and Wickramasinghe utilize the above data in support of their theory that life was carried to Earth in the tails of comets. And, to be sure, comets *are* known to radiate strongly in

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[1] "Sun-Bathing Bacteria," *Discover* (January 1981), p. 10.

[2] *Ibid.*

[3] F. Hoyle & C. Wickramasinghe, *Evolution From Space* (N. Y., 1981), pp. 12-13

[4] *Ibid.*, p. 118.

Flies, of which different kinds are shown above, possess eyes the outer part of which is transparent to ultraviolet light.

the ultraviolet.[1] But, given the above scenario in which Earth formerly basked under the ultraviolet radiation produced by a sub-brown dwarf star, the arrival of insects on Earth from comets need hardly be assumed. Besides, flies and bees are not the only creatures adaptive to ultraviolet light. Were butterflies also deposited on Earth from the tails of comets? And birds? And fish?

ULTRAVIOLET REFLECTION

Roger Ashton had noted that at least "four genera of American butterflies are of Oligocene antiquity, and that they thereby predate by an ocean of time any episode of primeval purple darkness."[2] In this, however, Ashton was assuming that the proto-Saturnian age of ultraviolet radiation was sandwiched between a prior and an ensuing period of regular light that occurred only once throughout the period of proto-Saturn's sway on Earth, and that this took place during the age of man. To be honest, at the time so did I.

In speaking of one of these butterflies of Oligocene antiquity, the one known as *Doxocopa*, Ashton surmised that it may "possess a sexual recognition based on color, which is totally lacking in some other species of butterflies."[3] He was led to this primarily because of the different wing colors between the males and females of this species.[4] Identical suspicions concerning butterflies in general actually go back to Charles Darwin. As Ronald Rutowski was eventually to demonstrate:

> "Recent experimental work with butterflies has borne out Darwin's suspicions of more than a century ago. Color is now known to spark sexual interest for *some* species in the butterfly world, as do other sensory signals that were beyond Darwin's human perception."[5]

Additionally, Ashton also noted that some butterflies, like the Yellows and Sulfurs of the genus *Colias*, have ultraviolet reflective patches on their upper wings.[6] The ultraviolet reflective properties of the wings of these and other butterflies became the special study of the above named Rutowski. Thus, as he shows, the males and females of *Eurema lisa*, commonly known as Little Yellows, "appear an identical yellow to the human eye, the shade being produced by pigments in the tiny scales that cover the butterflies' translucent wings." But the yellow wing scales on the upper surfaces of the males' wings reflect ultraviolet light while those of the females do not.[7]

From an evolutionary stance, there would be no point in having ultraviolet reflective wings if this reflection remains invisible, thus serving no valuable purpose. As with human

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[1] C. Sagan & A. Druyan, *Comet* (N. Y., 1985), p. 136.

[2] R. Ashton, "The Age of Purple Darkness," *AEON* V:3 (December 1998), p. 100.

[3] *Ibid.*

[4] *Ibid.*

[5] R. L. Rutowski, "Mating Strategies in Butterflies," *Scientific American* (July 1998), p. 64 (emphasis added).

[6] R. Ashton, *loc. cit.*, citing A. B. Klots, "Colias," in W. H. Howe, *The Butterflies of North America* (N. Y., 1975), p. 354.

[7] R. L. Rutowski, *loc. cit.*

vision, there would be no distinction between the males and females of *Eurema lisa*. However, as Rutowski tells us: "Males and females look quite different to butterflies...which perceive light at wavelengths beyond the human visible range *and into the ultraviolet*."[1] The same is true of those butterflies mentioned by Ashton, known as *Colias eurytheme*, or Orange Sulphurs, but not the *Colias philodice*, or Clouded Sulphurs.[2] The only difference, without going into too much detail, is that in some cases it is the males which reflect in the ultraviolet, while in others it is the females.

Various experiments conducted by Rutowski then showed beyond any reasonable doubt that the ultraviolet reflection of these butterfly wings play a dominant role in sex recognition which then leads to successful mating.[3] Further study even showed that as the wings of the male Orange Sulphurs begin to lose their scales with age, virgin females tend to avoid them in preference to males with intact wings.[4]

The problem here is this: Most butterflies do not possess ultraviolet reflective wings. In some, the color of their wings under ordinary light suffices for sex distinction. In most, even this is immaterial. It is therefore quite apparent that the ultraviolet property of those butterflies which possess it is evolutionary redundant. Unless, of course, there was a time when *all* butterflies possessed this trait. But if so, how is it that most butterflies have forfeited this quality?

The above question brings us back to Ashton. As he himself was astute enough to realize in one sense, yet led astray in another, "loss of adaptation would take far more evolutionary time than could have elapsed since any mythical darkness, for, if this were not so, humans would have no appendix, and would have a bipedal, instead of a quadrupedal, viscera."[5] Where Ashton went astray—as so did I—was again in assuming that the era of ultraviolet light had been a short period which ensued sometime in the early age of man and, obviously, quite late in the history of the world (a subject we shall be returning to in the next volume of this series).

The related question of why some butterflies managed to retain their ultraviolet reflective wings brings us back to the theory of phylogenetic memory discussed above. And yet, let me not be misunderstood. I am not proclaiming that the era of ultraviolet light stretched unbroken all the way from the very advent of life to the Oligocene—since Ashton mentioned it—and beyond to the age of man. What I suggest is that there was more than one age of purple darkness; that eras of ultraviolet light were periodic; and that none of these would have been of drastic duration.

We encounter the same situation with birds. No, birds do not have ultraviolet reflective wings, but it has been known for decades that they can see ultraviolet light.[6] What use this ability was to birds remained unknown until Douglas Altshuler decided to study the fruit on Barro Colorado Island in Panama.

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[1] *Ibid.*, (emphasis added).

[2] *Ibid.*, pp. 65-66.

[3] *Ibid.*

[4] *Ibid.*, p. 66.

[5] R. Ashton, *loc. cit.*

[6] A. Ananthaswamy, "Go for the Glow," *New Scientist* (October 20, 2001), p. 20.

**RIGHT: Orange Sulphur male the wings of which reflect ultraviolet light. The female's wings do not.
LEFT: Clouded Sulphur female which does not reflect ultraviolet light. Neither does the male.
It is thus obvious that the ultraviolet reflectivity of butterfly wings is evolutionarily redundant.
Might it not be due to the phylogenetic memory of an earlier primordial time?**

> "He found that fruits that reflect UV light were always conspicuous to birds against green leaves, whether in sunny or shady habitats. The more a fruit reflected UV light the better birds scattered the seeds."[1]

Unripe fruits, on the other hand, do not reflect ultraviolet light. Thus those fruits which reflected this light signaled their ripeness to birds.

> "To check his idea further, Altshuler and his team placed UV-absorbing filters high above a species of a low-growing plant called *Psychotria emetica*. The plant's fruits strongly reflect UV light and are mainly eaten by a ground-foraging dove and migratory thrushes. They found that the birds removed nearly all the fruits from plants that were allowed to bask in UV light, but removed fewer than two-fifths of the fruits from plants that had no UV reaching them."[2]

This brings us back to the fruit fly. Would not the fruit fly's ultraviolet vision enable it to detect ultraviolet reflective fruit, thus supplying an evolutionary reason why it retained such vision? Well, let us get one thing straight here: Fruit flies are not so named because they eat fruit, but because they deposit their eggs in fruit in which the larvae then live. What they are normally attracted to is the fermenting sap in some plants, decaying vegetation, and, of

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[1] *Ibid.*
[2] *Ibid.*

course, ripened fruit. What they actually thrive on is chiefly fungus which develops in such places. Sap and decaying vegetation do not reflect ultraviolet light. Some fruits, as we have seen, do. It is, however, not presently known whether fruit flies are more attracted to ultraviolet reflective fruit than to any other.

As Ashton also recorded, "[a]t least one species of fish has vision in UV to 3130 Å."[1]

All of which has been brought out here simply to indicate that none of the above requirements would prove an obstacle to our hypothesis that the sun which radiated on the primitive Earth was a sub-brown dwarf star the likes of which are known to radiate a propensity of ultraviolet light.

OF HARM AND BENEFIT

Everyone knows that ultraviolet radiation is harmful, and yet this is only partly true. In fact, in comparison to other types of radiation, ultraviolet rays may actually be considered relatively harmless. More than that, such rays can even be beneficial. For instance, ultraviolet radiation converts ergosterol, present in the human epidermis, to vitamin D, which is essential to health. Ultraviolet light is also known to successfully get rid of bacteria and viruses.[2] And was it not as far back as 1895 that Niels Finsen published his general theory concerning the effect of light on living organisms? Did he not there show that "it is the actinic rays found in the blues and violets of the spectrum which possess curative value and stimulating influence"?[3] Truth be known, even that form of mental disorder known as pibloqtok, which often affects the American Eskimos, appears to be linked directly to "calcium deficiency, brought on by poor diet and lack of sunlight" which can cause epileptic seizures.[4] Lack of sunlight is lack of ultraviolet rays.

Harm can only develop through *prolonged* exposure to these rays. Prime among such harmful effects is skin cancer, especially among fair-skinned people. "Negroes have a very low incidence of skin cancer compared to Caucasians," writes Richard Stoughton, "probably because of their increased amount of pigment and superficial horny material, both of which filter out ultra-violet light before it reaches the deeper areas of the skin."[5] Also, while the production of vitamin D can be beneficial, it is well known that too much of it can be as fatal as too little.[6] Victor Clube and Bill Napier put much of this succinctly when they reported that:

> "Many modern species on land and in [the] sea are already living close to their tolerance of ultraviolet radiation, so that even a small increase in exposure would be le-

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[1] R. Ashton, *loc. cit.*, citing G. L. Walls, *The Vertebrate Eye and its Adaptive Radiation* (1967), p. 488.

[2] R. B. Stoughton, "Light and Radiation in Relation to Health," *Encyclopaedia Britannica*, Vol. 14 (1959 edition), p. 83.

[3] A. U. Desjardins, "Finsen, Niels Ryberg," in *ibid.*, Vol. 9, p. 259.

[4] Charles & Cherry Lindholm, "World's Strangest Mental Illnesses," *Science Digest* (July 1981), p. 56.

[5] R. B. Stoughton, *loc. cit.*.; see also G. Kirchweger, "Black and White," *Discover* (February 2001), p. 33.

[6] F. Hitching, *The World Atlas of Mysteries* (London, 1979), p. 45.

thal. This might affect tropical plankton in particular, and it has been suggested that vitamin D production in exposed vertebrates might rise to toxic levels."[1]

I will not here venture into the ongoing worldwide debate concerning the so-called depletion of Earth's ozone layer, which layer acts as a filter for ultraviolet radiation. Some have blamed this apparent depletion on the intrusion of man-made chemicals into the atmosphere; others have claimed that the depletion is merely due to a natural atmospheric cycle in which the reduction is only transient.[2] Nor will I venture as much as a suggestion concerning what harm, if any, this reported ozone deficiency might have on living systems.[3] As Clube and Napier additionally reported: "The effects of ozone depletion on modern organisms, *let alone prehistoric life*, are not well understood."[4] I will only point out that, in Earth's early ages, the eventual accumulation of oxygen in the atmosphere would have resulted in the creation of an ozone layer. But, before that, early life forms *would* have been bathed in a fair amount of ultraviolet rays. As we have seen in one of our previous volumes[5]—because, proto-Saturn or not, primitive Earth would necessarily have been entirely different from the way it is at present—biologists had long come to the conclusion that the photosynthetic process could not have been primeval. And as we have also above noted, they therefore theorized that life must have originated through the aid of some unknown organic substances which were either produced by electrical discharges in the form of lightning or through ultraviolet radiation. But, sunlight being starlight, photosynthesis would have been able to occur just as well under the light shed by the sub-brown dwarf that once was proto-Saturn. Its dimmer light would have been compensated for by the plants' ability to control absorption in proportion to the incident radiation falling upon them just as modern plants continue to do in different environments throughout our present light-diversified world.

At present, we have no way of knowing how highly concentrated the ultraviolet rays from proto-Saturn would have been during the inception of life. Mosses in the Antarctic region, however, are able to produce certain compounds which act to protect them against excessive ultraviolet radiation.[6] Might it not have been possible that early plant life would have derived the same ability? Did not Levine admonish that ultraviolet rays are lethal to living systems "*as we know them*."[7] Thus at bottom lies the fact that we have absolutely no way of knowing whether *even prolonged* ultraviolet radiation would have been harmful to early life forms. All of which is not to say that once the ozone filter was in place in the terrestrial atmosphere, no further bombardment of excessive ultraviolet radiation was to take place. But, as we shall see in the very next chapter, these later onslaughts came in relatively short bursts.

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[1] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 109.

[2] See here G. Taubes & A. Chen, "Made in the Shade? No way," *Discover* (August 1987), pp. 62 ff.

[3] See here, for instance, F. B. Jueneman, *Raptures of the Deep* (Des Plaines, IL, 1995), p.102.

[4] V. Clube & B. Napier, *loc. cit.* (emphasis added).

[5] *God Star*, pp. 291-293.

[6] *New Scientist* (November 24, 1990), p. 24.

[7] P. Huyghe, *op. cit.*, p. 42 (emphasis added).

THE COLORS OF THE UNIVERSE

Would the effect of ultraviolet light on nature's hues have been evident to human eyes had humanity been around at the time?

Back in 1992, Bob Berman discussed the role colors play beyond Earth's familiar environment. That the stunning tints displayed in photographs of the cosmos are not always true to life has been advertised for quite some time. Published images of the planet Jupiter provide one example out of many.

> "Computer-enhanced images in textbooks and magazines routinely display photos of Jupiter without mentioning that the bright blues, reds, and yellows have been exaggerated for contrast [Berman tells us]. In fact, the touched-up version has effectively become the reality; I cannot recall seeing the true rendition anywhere for at least a decade."[1]

It is much worse when we look at the Universe beyond the planets of the Solar System. As anyone who has peered through a telescope at the night sky can verify, the colorful panoramas usually shown to the public at large are nowhere to be seen. This has mainly to do with the human eye's inability to perceive color in distant and faint images. Even when the color of some of these distant objects can be resolved, it might be anything but their true shade. The colors that these distant objects imprint through long exposure on high-speed emulsion films are entirely different from what the human eye perceives. The Orion nebula looks greenish through large telescopes. But photographic film captures it in red and deep purple without a hint of green. So which, Berman asks, are its true colors? The answer is simply that astronomers do not really know.[2]

But there's more to it than that. "Color," Berman tells us, "is a puzzling tricky business." Stars, for instance, appear in just about every color—except green.[3] But green, purple, red—all the colors you see displayed in astronomy photographs—have probably been manipulated, especially since this has become so easy to accomplish through the use of computer programs. And this is done by the very authorities who release the photographs—NASA and the Jet Propulsion Laboratory among them. Moreover, as Berman disclosed, even fewer of these pictures acknowledge that they have been manipulated except, needless to say, in those cases where it's pretty obvious.[4] What Berman had to say about the subject eventually came close to outright accusation of fraud, as note the following:

> "...the colors in many familiar photographs of the cosmos are fake...researchers paint them any way they choose...Researchers intensified color and contrast to maximize detail, and the media fell in love with the brilliant images...No scientific principles justify these embellishments..."[5]

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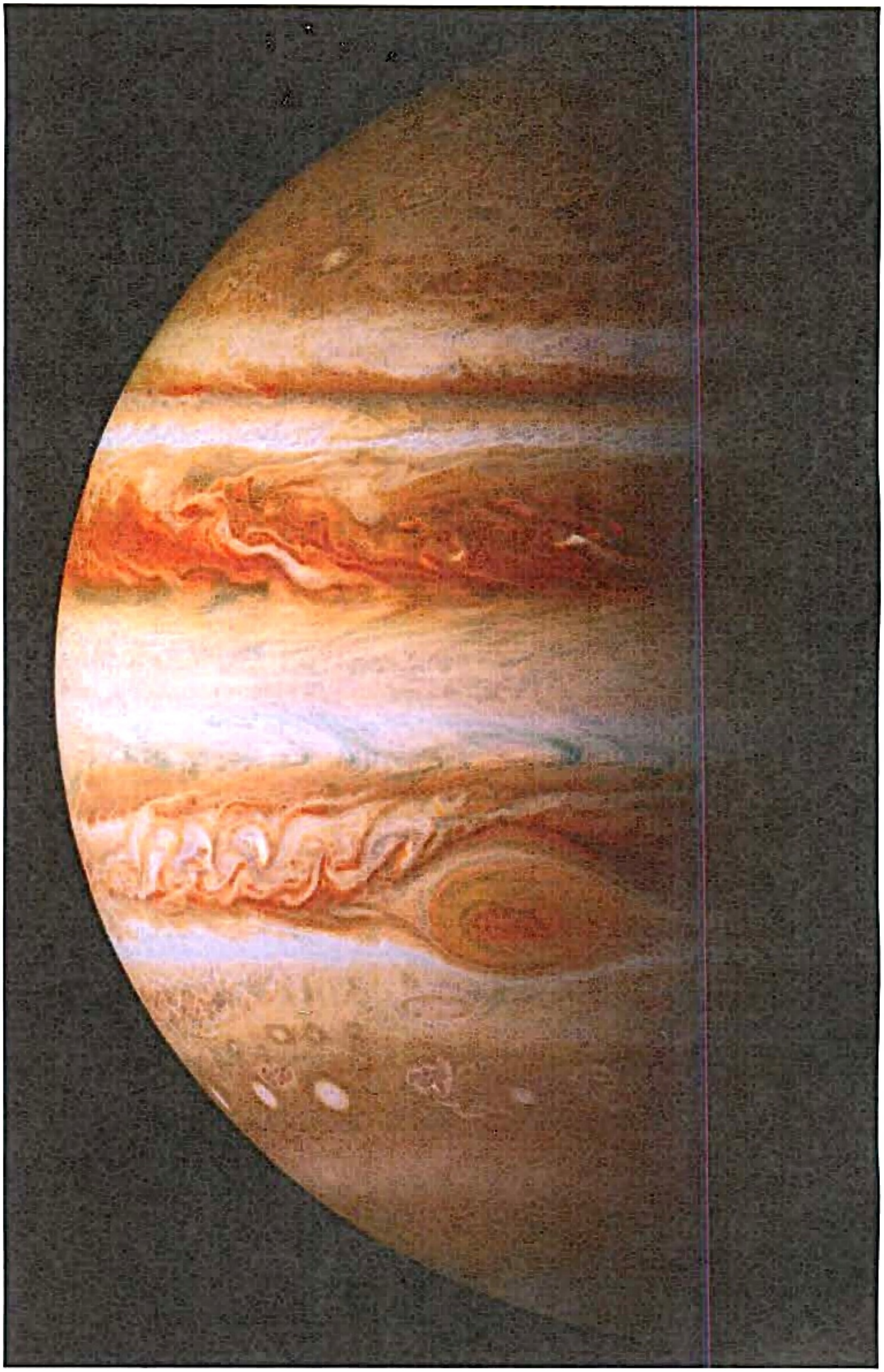
[1] B. Berman, "The Color of the Universe," *Discover* (February 1992), p. 81.

[2] *Ibid.*

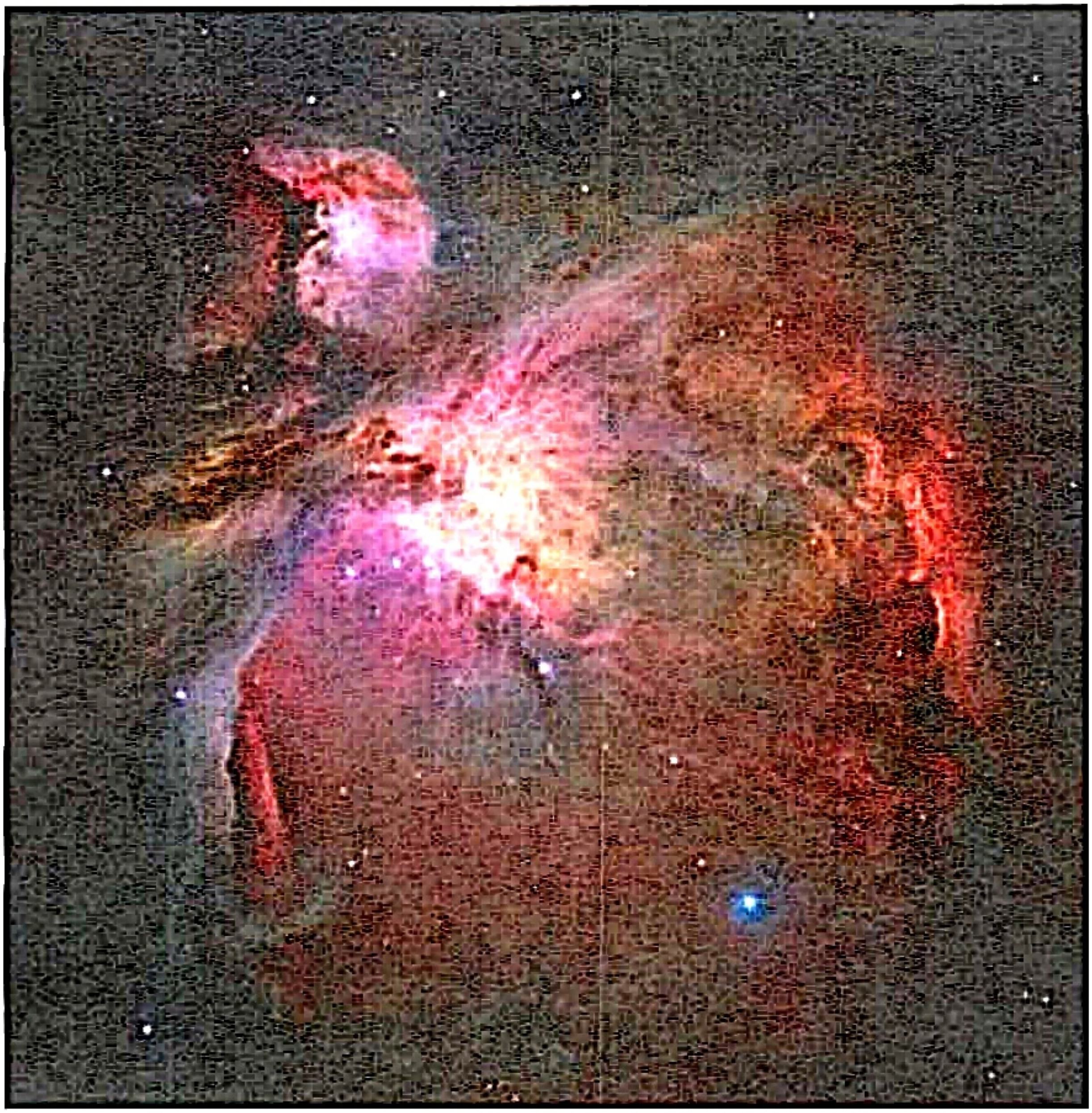
[3] *Idem*, "Seeing Red," *Astronomy* (July 1998), p. 82 (but see also p. 83).

[4] *Ibid.*, p. 86.

[5] *Idem*, "Colorizing the Cosmos," *Discover* (September 1999), p. 50.



Jupiter—with exaggerated color enhancement.
(Photograph courtesy of NASA.)



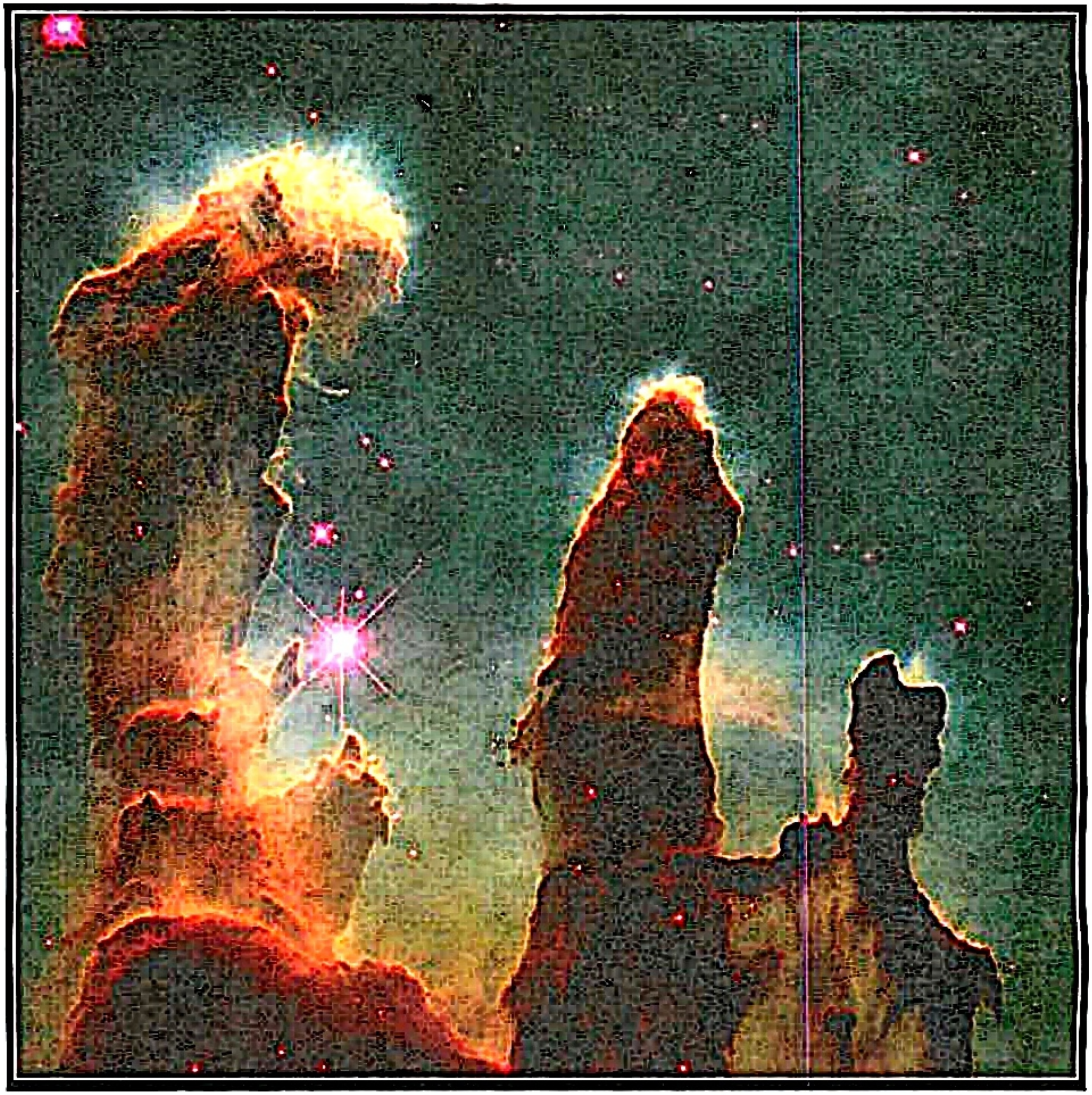
The false colors of the Orion Nebula
(Photograph courtesy of NASA.)

And:

"Yellow, orange, aqua, or violet probably means the image was colored. Scientists working with the Hubble Space Telescope seem to favor baby blue or turquoise, as they did with the famous image of the Eagle nebula."[1]

In fact, judging by the number of articles he has published on the subject, it seems as if Bob Berman was going out of his way to stress the near-colorless nature of the Universe. True, colors are "out there," he had to admit, but "they're very different than advertised."[1]

[1] *Idem*, "Behind the Scenes," *Discover* (February 2001), p. 34.



False-color image of the Eagle Nebula.
(Hubble Space Telescope photograph courtesy of NASA.)

The entire matter turns into a slightly different story when repeated for the enlightenment of the general public. What disconcerts me, personally, is that in such publications color is presented as one of the most important aspect of astrophysical interpretation. "Knowledge about any astronomical object," a recent coffee-table-type book announces, "is deduced from its brightness, shape, sky position and, *most important of all, color*."[2] And: "Much more than

[1] *Idem*, "Strange Universe—Extra Ingredient: Artificial Color?" *Astronomy* (September 2001), p. 82.

[2] M. K. Baumann, *et al.*, *What's Out There* (London, 2005), p. 172 (emphasis added).

simply aesthetics," the same book tells us, "astronomical colors yield clues to a celestial object's chemical makeup, temperature, motion through space and even distance from Earth."[1] But how can anyone deduce all this information from the color of an object if that color has been artificially applied?

Fair enough, the work in question does supply a clarification of sorts, but, again, it is one that is slightly tailored for acceptance by the general public. As there explained, spacecraft cameras produce their images through different colored filters, the overlap between which allows a "truly full-color spectrum" to be assembled. The challenge for the processors is to combine the overlapped-color information into "a reasonable representation of reality."[2] What remains somewhat shady, however, is the declaration that even artificial color can provide "an extra dimension for analyzing scientific details."[3] The truth, however, boils down to the admission that the assembly of an astronomical image "will always require an element of subjectivity and interpretation by the science image processor."[4] And this is where the danger lies. As Richard Fienberg, the then Editor-in Chief of *Sky & Telescope*, admonished in one of his editorials: "The pro mustn't do any processing that changes the relative brightness or colors of objects, because that would throw off any scientific measurements made from the image."[5] This, however, is a "mustn't" that is not easy to keep away from one's personal bias. Which is probably why Fienberg also unabashedly stated that every astrophoto is virtually a fake in one way or another.[6] In the meantime, beginning to sound like the proverbial broken record, Bob Berman continued to harp at what he was now referring to as the black-and-white Universe.[7]

THE PURPLE EARTH

With so much depending on the faintness of distant objects, atmospheric constituents, stellar characteristics, and the vagueness exhibited by cosmic hues, one does wonder about the nature of colors that would have been detectable by human eyes in a landscape bathed in ultraviolet light had humanity been around. Would green, for instance, have been apparent?

That this issue is not idly raised is borne out by Victoria Meadows. Hailing from the Virtual Planet Laboratory at Caltech, she was not much concerned with Earth's distant past. She did, however, remind her audience that while our Sun radiates most of its energy in the green part of the visible spectrum, ozone molecules in Earth's atmosphere absorbs most of this light, allowing the other colors to filter through. Worlds around other stars, however, may have different types of atmospheres which might filter different spectrums. Studies have thus indicated that "the color of a planet's photosynthetic organisms depend on the type of star the world orbits and the makeup of its atmosphere." What this means is that if trees grow on other

[1] *Ibid.*

[2] *Ibid.*, pp. 172-173.

[3] *Ibid.*, p. 173.

[4] *Ibid.*

[5] R. T. Fienberg, "The Camera *Always* Lies," *Sky & Telescope* (March 2006), p. 8.

[6] *Ibid.*

[7] B. Berman, "Black-and-White Universe," *Discover* (April 2006), p. 32.

planets, their leaves might be anything but green.[1] Take red and brown dwarf stars, for instance, both of which give less visible light. Any plants growing on planets associated with them, according to Nancy Kiang of NASA's Goddard Institute for Space Studies, might even be black.[2] And while it has been voted "the least likely plant color on any planet," under certain conditions, even blue could be possible.[3]

How about, then, here on Earth?

Shil DasSarma, a microbial geneticist at the University of Maryland, found himself pondering why chlorophyll, which is the major photosynthetic pigment of vegetation, absorbs blue and red solar wavelengths while reflecting green ones since, as already noted, the Sun transmits most of its radiative energy in the green part of the visible spectrum. His eventual solution to the problem, which had for long puzzled biologists, is that chlorophyll appeared after another light-sensitive molecule, known as retinal, was already ensconced on early Earth. In opposition to chlorophyll, retinal absorbs green light while reflecting red and violet. Although the names we give to some colors do not mean the same to everyone, the combination of red and violet is said to result in the color purple. Retinal and chlorophyll are both found in different microbes, and the former would have lent organisms a purple hue. The outcome of this, according to DasSarma, is that the "earliest life on earth might have been just as purple as it is green today..."[4]

Needless to say, not everyone agrees with DasSarma. To be quite honest, even he admits that his solution is "currently little more than speculation."[5] And while David Des Marais finds DasSarma's speculation interesting, he preaches caution against its acceptance. Perhaps that is because he himself favors an alternative explanation to account for chlorophyll's inadequacy in absorbing green light. His reasoning is that had chlorophyll the ability to absorb green light, it might end up harming, rather than benefiting, plants.[6] But this, to me, comes close to circular reasoning.

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[1] K. Than, "Colorful Worlds: Plants on Other Planets Might not be Green," *Space.com* (April 11, 2007).

[2] J. Barone, "Extraterrestrial Landscaping," *Discover* (July 2007), p. 15.

[3] *Ibid.*

[4] K. than, " Early Earth was Purple, Study Suggests," *livescience.com* (April 10, 2007).

[5] *Ibid.*

[6] *Ibid.*

Chapter 3

Geognosy

THE STRATIFIED SIGNATURE OF CATASTROPHE

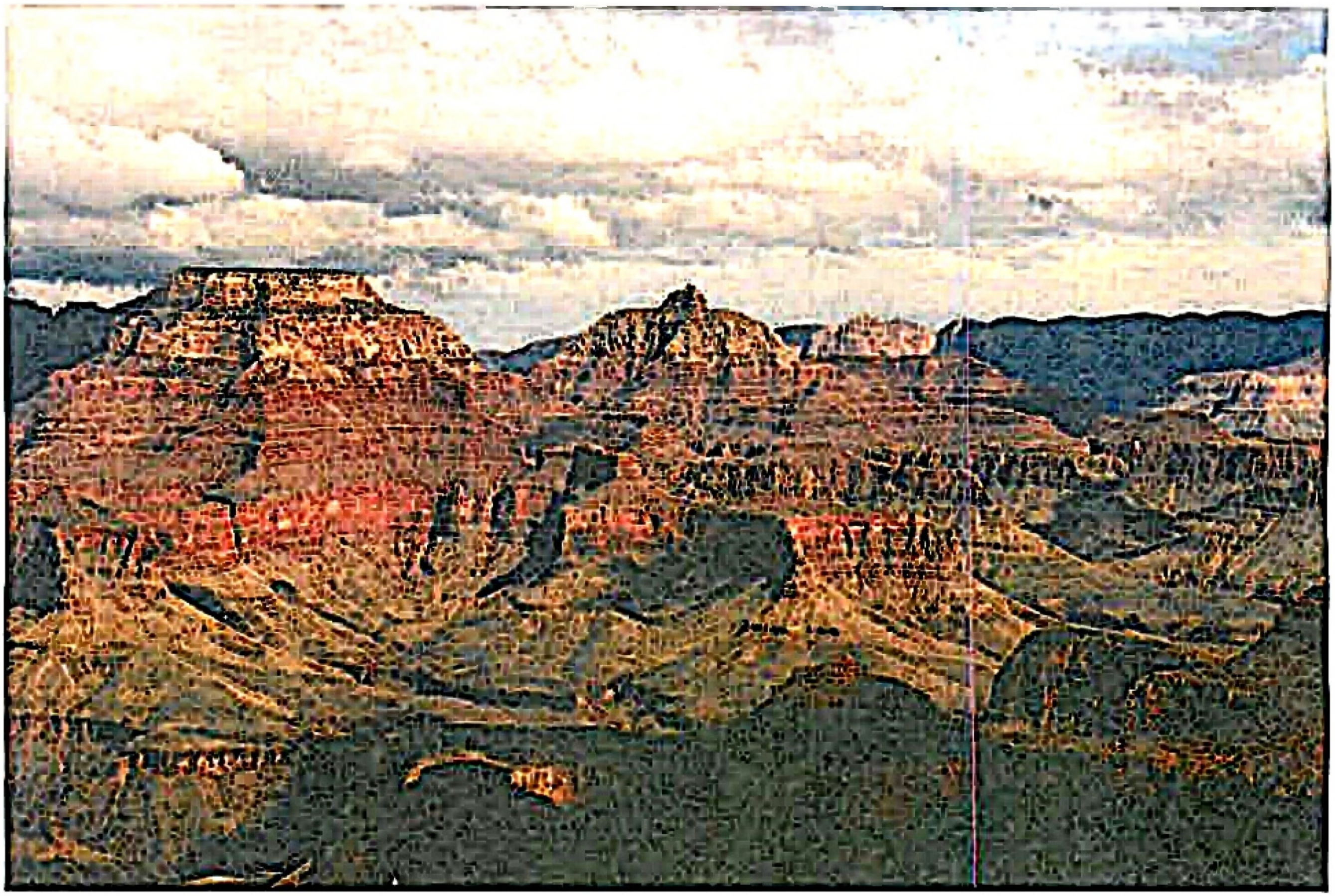
Vast portions of Earth's land areas are covered with stratified material which has been eroded and in places warped through tectonic forces through the ages. Such strata, both in their original horizontal sequences and in later wavelike distortions, can best be seen in places which have either been sheared through faulted uplift or otherwise gouged out by raging torrents or the hand of man. In such places it can be seen that each stratum is separated from the one above and/or below it in a clear demarcation. While intrusions penetrate some of the strata in some localities, the accumulations lack any sign of diffusive intermingling of the material within each layer. Despite later diastrophic deformity, each original horizontal layer looks as if a steamroller had leveled it before the next stratum was laid down. How did these sandwiched layers manage to accumulate in such an orderly fashion?

The mechanism behind this accumulation has been ascribed to the deposition of eroded material from the land into the world's oceans. But let us be quite clear about this from the very start so that it will not have to be repeated every time we run headlong into oceans and ocean bottoms: What we are concerned with here are not the deep ocean basins but the bottoms of the submerged continental shelves and, perhaps, a little beyond that. As Derek Ager was clear in pointing out, the deep ocean basins "are not environments much represented in the stratigraphical record of the continents,"[1] but the continental shelves are very much supposed to be.

To put the entire theory in the most compact of nutshells: Particles eroded by wind, rain, rivers, even the waves of the sea itself, would eventually have ended up in the oceans where they would have slowly sank to the bottom to form sediments. No matter how or from where particles may originate, most of them eventually end up in the sea. As these sediments grew in thickness, pressure, heat, and chemical reactions would have metamorphosed them into hard rock. The sea bottom is then assumed to have risen above sea level, where the forces of nature would again have eroded the surface of such layers. But then, again, the land would have sunk back into the sea, where more detritus would have accumulated to form the next layer above the partly eroded previous one. And this, it has been surmised, would have taken place time and again until, eventually, the entire mass would have eventually risen above the sea to remain as we find it at present. "If, for example," James Croll wrote in 1875, "there are six coal seams, one above another, this proves that the land must have been at least six times below and six times above sea-level."[2] This seemed to have been quite evident at the time because

[1] D. V. Ager, *The Nature of the Stratigraphical Record* (London, 1973), p. 57.

[2] J. Croll, *Climate and Time* (London, 1875), p. 424.



The clear demarcation of geological horizontal strata is quite evident at the Grand Canyon, Colorado. (Photograph by the author.)

the stratified beds *between* coal seams often contain remains of marine organisms.[1]

There had always been problems with this scenario. For one thing, since some of these stratified layers stretch with few breaks almost right around the world, it would mean that just about all the entire continents would have had to have sunk beneath the waves, which then would have left but very little for the forces of nature to erode until the land rose up again. For another, no clear consensus was ever reached as to what caused this cyclic series of sinking and rising of the sea bottom. True enough, some of these strata contain the fossils of marine creatures, but others contain those of land-based animals. These animals could be thought to have drowned when the land subsided, but since this was supposed to have been a very slow process, is it possible that such creatures would not have sought the safety of higher ground? Or was there any higher ground to reach?

Another problem with this theory, as with all others which have attempted to replace it, is that each succeeding layer in the geological column is composed of entirely different material. If the detritus was eroded from the same, or similar, landforms, why would the layers not have ended up of similar composition? Had the nature of the land changed that much in the inter-

[1] *Ibid.*

Distorted strata —Wu Gorge of the Yangtze River, China, now under water due to the building of the Three Gorges Dam at San Dou Ping.
(Photograph by the author.)

vening time between each rising and subsidence? There is no point in claiming that the later material would have been eroded from the former composition of the sandwiched layers because all of them would have originally come from the same type of land.

With the resurrection of the continental drift theory and the advent of plate tectonics it was realized that continents slide horizontally rather than vertically up and down. Despite this, however, the accumulation of eroded material as sediments in the ocean continued to be adhered to, if not in its entirety, at least in part. This was mainly because the presence of marine fossils in some of the strata still had to be accounted for. A further main objection here is that the principle of uniformitarianism dictates that this method of marine sediment accumulation would not have changed through the ages and that it continues to operate in the same way at present. If that is the case, the present ocean bottoms should be covered with thick sediment. And since the thickness of the resulting strata can be measured in thousands of feet, the loose sediment that formed them should have exceeded that thickness. But with the advent of ocean bottom exploration, it was soon discovered that the expected thickness of ocean bottom sediment was nowhere to be found. "If we look at the sea-floor maps that are now [in the early 1970s] becoming increasingly available," wrote Ager, "one is struck (at least I am) by the great areas that are either receiving no sediment at all or else are covered with the merest ve-

neer."[1] Moreover, the relatively shallow sediment at the bottom of the oceans consists of unconsolidated material and not of compacted particles on their way to being solidified and/or crystallized as theory would demand. Rather than building up into the solidified veins that are known upon the land, the sedimentary veneer that is presently discernable at the bottom of the oceans along continental shelves is simply seen to be moving to and fro at the discretion of the waves and/or underwater currents.[2]

Since ocean bottoms are now believed to be constantly replenished by the upwelling of material from the rifts on mid-ocean ridges, which material then moves laterally away from the rifts in opposite directions, one may argue that ancient sediments beyond the edge of the continental shelves would have also been rafted away in this manner. Eventually, or so it is presently believed, the moving ocean bottoms are subducted beneath the continental shelves. But most of the ancient sediment cannot be lost under the continents because, as already noted, most of it is supposed to have accumulated *on* the continental shelves *beneath which* the moving plates are said to be subducted. However, it is also believed that this subduction tends to fold the shelves together with their sediments and uplift them into mountain ranges. This explains why most mountains, but not all, are composed of warped stratified rock. But if that is the case, judging by the number and thickness of these folded strata, not much sedimentary material could have been lost beneath the continents through subduction. Geologists cannot have it both ways. And then, these strata could not have been folded into mountains until all of them had been laid out on top of each other. This, then, would bring us back to a required heavy sedimentation on continental shelves which, as we have seen, is not what is presently occurring in these regions.

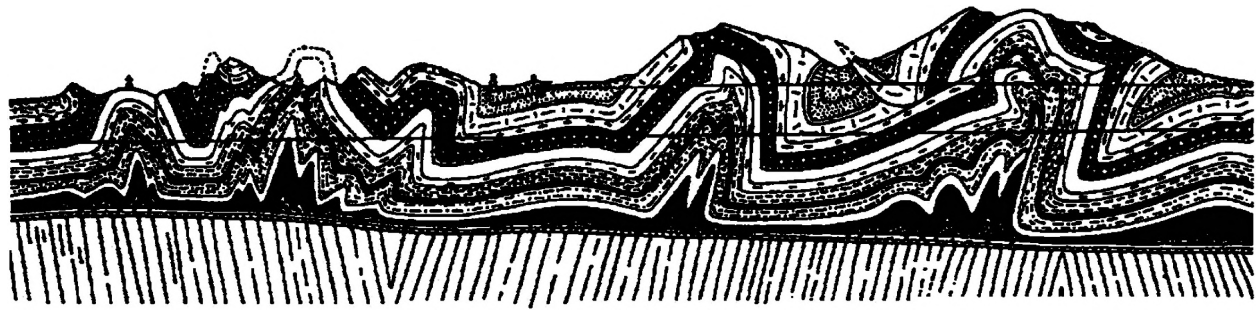
Other strata, however, were by then believed to have accumulated on the land itself. But this raises its own problems. True enough, aeolian sedimentation does take place on land. It has been argued, although never proven, that there would be no sandy deserts without it. The sand in the deserts of the world does not however solidify into rock layers. One may argue that such sand is never deep enough to foster solidification through pressure and resultant heat. But that is precisely the problem with land-based sedimentation.

The most noteworthy facet of stratified rock, however, lies in its abrupt demarcation between the different layers. And here an additional conundrum stares us squarely in the face. Various fossils preserved in one layer are not duplicated in the ones above or below it. What this means is that those animals which proliferated while one layer was being deposited became extinct while others appeared as if out of nowhere by the time the next layer was laid down. Extinction can be readily explained through various causes, but where did the new forms come from?

It has been explained time and again that the new forms were really the evolved descendants of the old ones, but nowhere has anyone found the fossils of the intermediate forms. This has often been blamed on the discontinuity of the geologic column. Subsequent erosion, it has been claimed, would have erased much of the record. But while it is true that certain strata are missing in certain localities, it is not reasonable to maintain that all those strata

[1] D. V. Ager, *op. cit.*, p. 43.

[2] *Ibid.*, p. 57.



Fifteen kilometers of the folded strata which make up the Jura mountains.
(Illustration after Buxtorf.)

which would have contained intermediate species have all disappeared from all over the world *and in each and every stratified case*. This also brings the evolutionary, or family, trees paleontologists are so fond of reconstructing into question. How can such trees be reconstructed when just about all of the intermediate forms, or links, are missing?

Eventually the tide of opinion among geologists and other ologists began to turn—even though not immediately far enough and in some cases taking off in the wrong direction. Commenting on the slow process through which geological changes are supposed to occur, Bennison Gray rightly claimed that "everything can be worn away given enough time."[1]

> "But it is of little value [he went on]. Geologists cannot convincingly explain with little-by-little how a huge rock formation is lifted in a single piece from its place of origin and *left resting much higher on top of newer strata.* Nor can they explain how a whale could be perfectly fossilized in marine sediments while standing on its tail."[2]

And to show that this was nothing new even then, Gray quoted from the earlier work of Heribert Nilsson, who wrote in the 1950s:

> "A study of the history of past epochs, as written down in the palaeontological layers from several hundreds of millions of years, shows that no calm evolution can be read into the text, neither from a stratigraphical nor a palaeobiological viewpoint. Violent revolutions, biological cataclysms, must have happened at least sometimes."[3]

As for the so-called missing strata, Gray, with Nilsson, was of the opinion that the "fossil record is not fragmentary but rather presents an embarrassment of riches."[4] And, quoting again from Nilsson, he adds that:

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[1] B. Gray, "Alternatives in Science: The Secular Creationism of Heribert Nilsson." *KRONOS* VII:4 (Summer 1982), p. 13.

[2] *Ibid.* (emphasis added).

[3] *Ibid.*

[4] *Ibid.*

"...the lack of transitional series cannot be explained as due to the scarcity of the material. The deficiencies are real, they will *never* be filled."[1]

Granted that Nilsson was a secular creationist, he should not be confused with Biblical fundamentalists. Unlike armchair geologists, his knowledge of the geological record was received first hand. Regardless of what some might see as his shortcomings, what he preached about Earth's stratified sedimentary accumulations was written in the ground itself and there for all to read.

Nilsson and Gray were not the only scholars who went against the geological grain. In 1988, Richard Huggett also began asking for a reconsideration of catastrophist theories in relation to the geological landscapes we have been analyzing.[2] At about the same time, A. Hallam could write that: "There is now widespread acceptance that sedimentation is frequently a short-lived episodic process interrupted by much longer intervals of non-deposition..."[3] The belief in punctuated evolution is also gaining ground. It is thus becoming quite obvious, as some had been for long maintaining, that something drastic must have transpired during those periods of sedimentary deposition.

"Between the layers, something must have happened," Peter Warlow wrote. "If nothing had happened, there would be no reason why the next layer should be any different from the previous one, so there would be no dividing line."[4]

We, on the contrary, believe that nothing much transpired during the periods *between* the deposition of the layers, and that an awful lot was taking place *during* the time of deposition. Had that not been the case we would not find the remains of so many extinct species entombed within the layers. There is no point in claiming that these remains are merely evidence of natural deaths. Animals die natural deaths at present too, but their remains do not turn into fossils. Ager was thus on target when he compared the eras during which sedimentation occurred to the life of a soldier as having consisted of "long periods of boredom and short periods of terror,"[5] where the only question left to answer is whence the "terror"?

That strata can be deposited by catastrophic means has long been known. This is evident by the exposed cliffs of successively bedded volcanic emissions. And that this stratified material can solidify into rock, even if loosely held together, without the overwhelming pressure dictated by theory is also known. On the top of the stratified volcanic tufa cliffs of Santorini, entire towns have been built. At best, however, these attest to local catastrophes. That volcanic material is often found mixed with other detritus in the more widespread geological record is quite apparent, but most of the material, it must be said, is of non-volcanic origin. Nor is it reasonable to maintain that these strata were laid down by the action of world-wide tsunamis, which is not to say that the inundation of the seas upon the land would not have lent

[1] *Ibid.* (emphasis as given).

[2] R. Huggett in *Progress in Physical Geography* 12 (1988), pp. 509-532.

[3] A. Hallam, "Catastrophism in Geology," in S. V. M. Clube (Ed.), *Catastrophism and Evolution* (Cambridge, 1989), p. 35.

[4] P. Warlow, *The Reversing Earth* (London, 1982), p. 167.

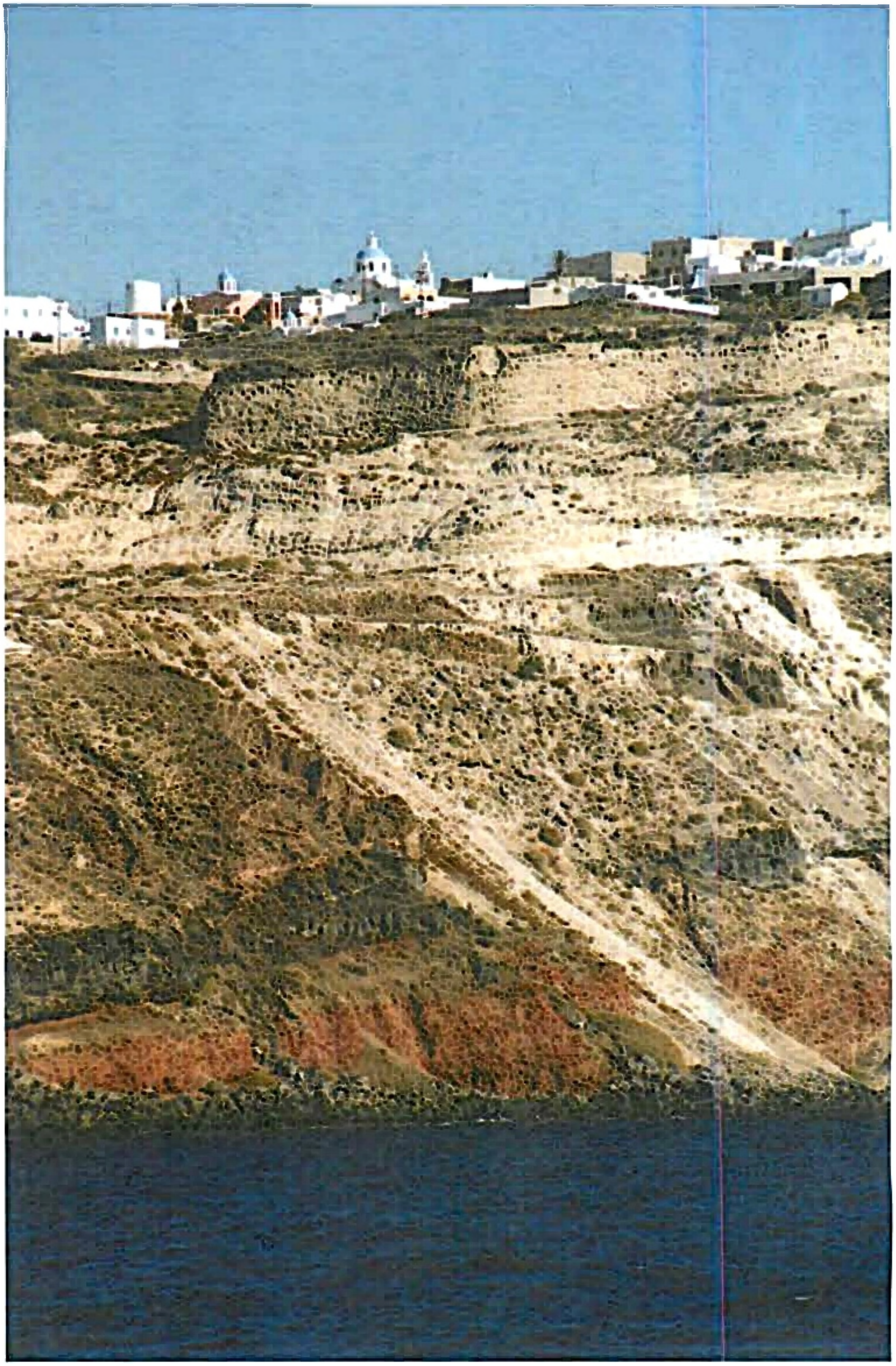
[5] D. V. Ager, *op. cit.*, p. 100.

The remains of animals who die natural deaths do not at present form fossils. Shown above: Wildebeest skeletons at a river crossing, Masai Mara, Kenya. (Photograph by the author.)

a hand. But if we were to restrict the deposition of sediment thousands of feet in thickness through such stormy incursions of the sea upon the land, we would have returned to our point of departure since we would once again have to account for the accumulation of this sediment in the world's ocean bottoms in the first place. If, as already noted, the ocean bottoms are not burdened with sedimentation of required thickness, from where would such waves of translation have obtained enough concentrated material to cast upon the land?

Another theory is that sedimentation gathered at the bottom of land-locked seas, which seas were eventually squeezed out of existence by the colliding continental plates. That some inland seas would have suffered this fate is not objected to. But before being squeezed out of existence, such sea bottoms would still have had to rise and sink untold times in order to account for the massive stratified material they are supposed to have left behind. Besides, there are various vestiges of such prehistoric seas, such as the one in southwestern Bolivia. This one evaporated rather than having been *squeezed* out of existence. All that is left now is a brackish water hole.[1] But, in its hey-day, according to theory, it, too, should have accumulated tons of sediment, despite the fact that they are nowhere to be seen.

[1] L. McIntyre, *The Incredible Incas and Their Timeless Land* (Washington, D. C., 1975), p. 88.



The stratified tufa cliffs of Santorini
on top of which entire towns have been built.
(Photograph by the author.)

Various previous catastrophists have therefore opted for a series of sudden deposition of detritus from the sky above—a rain of stones, gravel, and sand. Some have blamed these abrupt onslaughts on Earth's passage through the tails of comets.[1] Others have vouched for an even more exotic source.[2] Whatever the real cause, the above mentioned Nilsson had no doubts that "only an extra-terrestrial force could account for the magnitude of destruction clearly recorded in the various sedimentary deposits around the world."[3]

The one thing that can be said for certain at this point is that there is nothing about the geological strata, or the demarcation between them, that bespeaks a uniformitarian process. This is especially so when we encounter the fossilized remains in these strata of such creatures as soft as jellyfish. What—they died in open water without any other creature having eaten their remains? They were embedded in loose sediment without having decomposed? How did *they* turn to stone? How is it that fish fossils have managed to preserve their soft muscle tissue? How were others fossilized with prey still in their mouths?[4] Does this not speak of sudden fossilization?

How did dinosaur footprints in miry shores solidify into rock? Why did the breakers of the "wave rippled shore" of the "inland sea"[5] in which they supposedly left their marks not wash the footprints out of existence in a mere matter of hours? Humans leave footprints on beaches all the time. How long do they last? But what if the footprints were laid in mud which then solidified through heat? But even caked mud remains brittle. How could the deposition of further sediment on top of such hardened mud not flatten the footprints out of existence? How did such footprints, definitely imprinted in soft material, survive for the calculated millions of years into the present? How did some of these solidified shores, still bearing said footprints, end up in a vertical position?[6] Such vertical strata are quite common and there is no doubt that they were somehow tilted from the horizontal through tectonic forces. But then we find horizontal strata laid on top of vertical ones.

What seems to have transpired, we are told, is that the top edges of the vertical layers were eroded flat, thus providing a level bed for the next layer of sedimentation. At present, however, erosion does not work in that manner. As Jill Abery noted, where upthrust strata is being seen eroded by wind and other forces, the tops of these intrusions end up in extremely irregular surfaces.[7]

One more thing to keep in mind is that not all geological strata is sedimentary in nature. Coal seams are definitely not. Can we learn anything from the formation of coal that might throw light on the manner in which geological strata were laid down and preserved through the ages?

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[1] I. Donnelly, *Ragnarök: The Age of Fire and Gravel* (N. Y., 1883), *in toto.*

[2] See here, for instance, R. Petersen, *New Insights to Antiquity* (Phoenix, 1998), *in toto.*

[3] B. Gray, *loc. cit.*

[4] J. Abery, reporting on a talk given by Michael Garton at the 1994 Annual General Meeting of the Society for Interdisciplinary Studies, *Chronology & Catastrophism Workshop* (1994:2), p. 2.

[5] R. Gore, "Dinosaurs," *National Geographic* (January 1993), pp. 16-17.

[6] *Ibid.*

[7] J. Abery, *loc. cit.*

COAL SEAMS

Just about every catastrophist of the past has written about coal; and so must we. The belief that coal is formed from the carbonized remains of plants, including trees, is well known. The accepted theory states that coal-forming plants had once thrived in swampy areas. However, at present, when plants growing in swamps succumb, they usually decompose. On the other hand, that the plants which supposedly went into forming coal did not decompose is claimed to be evidenced by the imprints they left in the resulting coal. Images of ferns and the leaves of a multitude of different trees still etched in coal are so perfectly preserved that they can be readily identified for what they are. It has therefore been surmised that before these fallen denizens of the forests had time to decompose, they were covered by the waters of the swamps in which they had thrived. But then we find deposits of sand above coal seams which indicate a sedimentary layer that had somehow covered the coal-forming remains. And because other coal seams are found on top of this sandy deposit, it has been reasoned that the sand acted as the soil on which a new forest grew and thrived before it, too, suffered the same fate as the previous one.

Marine fossils are also often found embedded in the layers between coal seams.[1] An incursion of the sea is then blamed for these deposits but, because coal was then again formed on top of them, the sea must again have retreated. The problem here is that in certain areas as much as 400 coal seams have been found interspersed between other layers of sedimentation. This, then, would mean that the sea must have inundated the land and again retreated that many times. And each time, of course, a forest would have to have grown in the very same area.

Another problem is that many of the plants recognizable from their imprints in coal do not presently grow in swamps but on dry ground. This then led to a new theory according to which such trees, once fallen, would have been carted away by overflowing rivers. This could explain why, in some areas, tree trunks have been found embedded in coal seams in an upright position with their roots uppermost. It does not, however, explain why other trunks have also been found upright in their original growing position with their roots still in the ground, unrotted and uncarbonized. In both cases, one is left to wonder why these trunks were not themselves turned into coal.

Yet another objection focuses on the fact that some of these individual coal seams are as much as fifty or more feet thick. This would then have required the compression of plant matter the original thickness of which would have measured thousands of feet. And this, according to the number of separate coal seams, would have had to repeat itself at least a hundred times—all of which begins to stretch one's credibility. But then, as Immanuel Velikovsky noted, are these separate coal seams really indicative of successive forest growths? If so, why do we find certain layers bifurcating into numerous other seams each of which is separated by sedimentary layers?[2]

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[1] See here especially H. G. Coffin, "Evidence for the Marine Deposition of Coal," *S.I.S. Review* IV:2/3 (Winter 1979/80), pp. 68-69.

[2] I. Velikovsky, *Earth in Upheaval* (N. Y., 1955), pp. 217-218.

Velikovsky had his own theory on the formation of coal and, although it, too, suffers from certain drawbacks, it does present a more reasonable-sounding procedure. As he had it stated in the following oft-quoted passage:

> "Forests burned, a hurricane uprooted them, and a tidal wave or succession of tidal waves coming from the sea fell upon the charred and splintered trees and swept them into great heaps, tossed by billows, and covered them with marine sand, pebbles and shells, and weeds and fishes; another tide deposited on top of the sand more carbonized logs, threw them in other heaps, and again covered them with marine sediment. The heated ground metamorphosed the charred wood into coal...Wet leaves sometimes survived the forest fires and, swept into the same heaps of logs and sand, left their design on the coal. Thus it is that seams of coal are covered with marine sediment; for that reason also a seam may bifurcate and have marine deposits between its branches."[1]

It nevertheless remains somehow difficult to understand how a tidal wave could have split a coal seam as with a chisel and driven its own sediment into the cleavage, since such a procedure seems to call for a seam which must already have been formed.

And yet, at least at first glance, there seems to be more than one saving grace to the scenario Velikovsky espoused. Thus, for instance, earlier opinion often stressed that, if anything, the forests which produced the coal could definitely not have burned up.[2] The carbonization of coal deposits is usually attributed to the fact that plants already contain carbon. A carbon content, however, is not the same as carbonization. But if coal is derived from the burned remains of plant life, the carbonization of coal is readily explained. This is lent credibility by the fact that various forests covering thousands of acreage, and calculated to be something like 70,000 years old, have been discovered buried in the peat of the British Fenlands, including Scotland and Ireland. While these trees are not burned, neither have they turned to coal. However, to be clear on this, as Wilfrid Francis was later to point out, the carbonization of burned trees could only have occurred if the burning had been checked by flooding *before* the total destruction of the forests.[3]

Forest fires, often started by lightning, go on at present. There are, in fact, various such forest fires ranging through British Columbia, the Canadian province in which I reside, even as I write this. Burned forest remains, however, do not presently seem to be turning into coal. Hurricanes also continue to occur, year after year, in various parts of the world. No hurricanes have ever been known to uproot entire forests, whether in flame or not. So, likewise, with tidal waves. Although tsunamis have been known to wash over lands, such incursions do not presently reach the interior of continents. If such an event as described by Velikovsky ever took place, the hurricanes and waves responsible for the uprooting and transporting of entire burned forests would have to have been of planetary dimensions. This, then, would call for a cosmic cause, which is definitely what Velikovsky had in mind.

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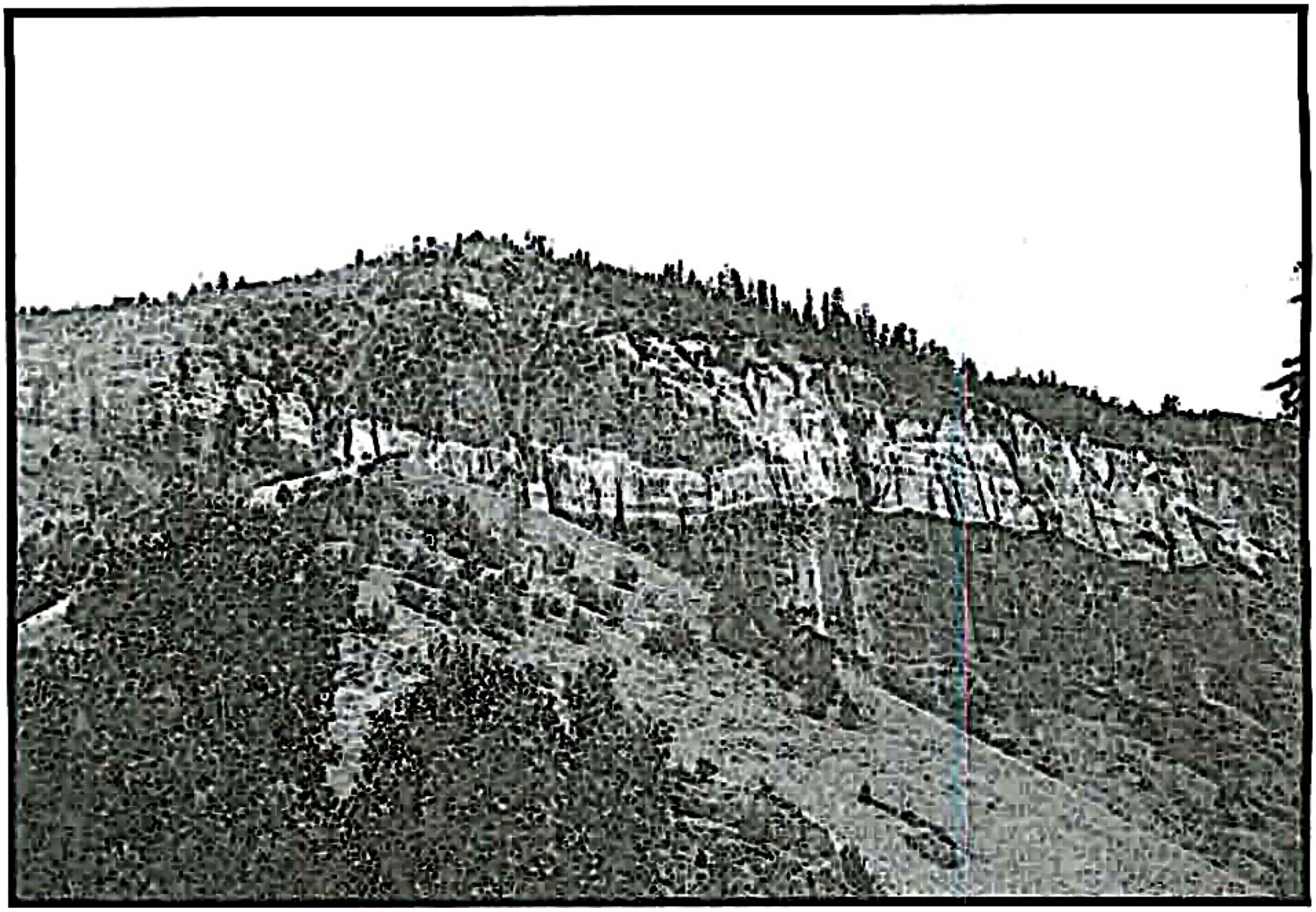
[1] *Ibid.*, pp. 218-219.

[2] See here, for instance, G. McCready Price, *The New Geology* (Mountain View, California, 1923), p. 465.

[3] W. Francis, *Coal: Its Formation and Composition* (London, 1961), p. 625.



Although not a coal seam as described in the text, the above, from central Oregon, is a good example of bifurcated strata.
(Photograph by the author.)

But are forest fires really needed? Artificial coal has been produced without setting anything on fire, but simply by heating lignin, the substance that binds plant cells together. Clays are used to catalyze the conversion of lignin to coal while heating the concoction at 300°F for as short a period as two weeks. Higher grades of coal simply require longer heating.[1] Heat—not even pressure—seems to be sufficient, at least for the formation of artificial coal. Could natural coal have been produced without forests having been set ablaze?

Some may argue that when it comes to natural coal, it does seem that pressure is required. Thus, as Richard Milton noted, coal beds that are near to the surface are closer to peat in consistency, whereas the deeper the beds, the more likely they are to constitute or approximate anthracite.[2] And yet sedimentary strata containing a profusion—one might even say confusion—of fossilized plants squeezed into relatively thin sections are often discovered above and/or below coal seams.[3] Why did pressure not turn this vegetable assemblage into coal?

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[1] *New Scientist* (September 1, 1983), p. 623.

[2] R. Milton, *Shattering the Myths of Darwinism* (Rochester, 1997), as cited by R. W. Wescott, *The Velikovskian* IV:2 (1998), p. 32.

[3] G. McCready Price, *op. cit.*, p. 467.

No hurricanes have ever been known to uproot entire forests.
Shown above: Snapped trees in the Cozumel Island forest, Mexico, destroyed by the 2005 hurricane which got "stuck" in the same area for days.
(Photograph by the author.)

In order not to leave anything out that might be considered of importance, I even include the following: The Australian Aborigines tell of a mythological giant ancestor who had set so many trees ablaze that he left nothing in his wake but charcoal and a treeless desert. When Europeans settled the land, the Aborigines showed them the resultant seam of charcoal. It turned out to be coal.[1] If this constitutes a *bona fide* eyewitness report of a coal-forming event, the coal in question would have to have been formed during the Holocene, and suddenly at that. The question is: Did the Aborigines really see it happen? Or, having come across the seam of "charcoal," which they readily recognized as the carbonized remains of plant life, did they simply put two and two together?

One particular case that might also bear on all this concerns some timbers which were sealed in a Pennsylvania coal mine for the purpose of suffocating a fire. When they were examined ten years later, they were found to have been coalified.[2] Pressure did not play a role.

[1] A. Roberts, *Echoes of the Dreamtime* (1990), pp. 56, 114.
[2] M. A. Cook, *Scientific Prehistory*, as cited by A. N. Beal, "A Life's Work?" *Chronology and Catastrophism Review* XVI (1994), p. 53.

Velikovsky also pointed to the amount of tropical flora, and even fauna, that has been discovered in the brown coal of Germany, in the latitude of which no such plants and/or animals presently thrive.[1] His reasoning here is that these remains could only have been uprooted from tropical latitudes and swept into the European hinterland by the action of tidal waves. In our own scheme, however, this need not have transpired since the *entire* Earth would have been basking in a tropical and/or sub-tropical climate under the plasmasphere-encased proto-Saturnian sun.

Much more telling is Velikovsky's point concerning the preservation of chlorophyll in the leaves found embedded in coal.

> "[These] leaves must have been rather quickly excluded from contact with air and light, or rapidly entombed: these were neither leaves falling off the plants in the fall nor leaves exposed to the action of light and atmosphere after being torn off by a storm. Entire strata of leaves from all parts of the world, counted by the millions, though torn to shreds but with their fine fibers (nervature) intact, in many cases still green, are found in the Geiseltal lignite [of Germany]."[2]

So, also, with insects preserved in the same coal. They retain the "splendor" of their original colors, and yet most of them have been torn apart. And as for the remains of animals in the same coal seams, it is amazing to find that their epidermis and muscle tissues have often been preserved in fine detail[3]—all of which bespeaks a sudden and catastrophic end.

Theories of coal formation must also account for the fact that dinosaur footprints have been found on the top surface of coal seams in Utah. The proposed explanation has been that the dinosaurs walked over the soft peat bed from which the coal was later to solidify.[4] But — as in similar cases—how could such marks in a soft material have remained imprinted through the ages despite the weight of the strata which accumulated on top of them?

That peat formed the primal stages of a concoction through which coal eventually formed under pressure is also contested by the fact that the physical and chemical constituents of peat are entirely different from that of coal. As Dolph Hooker maintained, the only similarity between peat and coal is that they both burn.[5] Unlike coal, peat is not carbonized. In fact, occurring mainly in bogs, peat consists of up to 90% water. Definitely the product of decayed aquatic vegetation, it cannot burn until rid of its water. Cut into soft bricks or larger slabs, it therefore needs to be dried before it can be used as fuel.

Judging by the geologic strata between which coal seams are found to be sandwiched, it can be demonstrated that coal formed at various times in the past. It formed mostly during the Carboniferous period of the Palaeozoic era (calculated at c. 320 million years ago), but also during the pre-Cambrian period (c. 570 million years ago), the Silurian period (c. 425 million years ago), the Devonian (c. 365 million years), Cretaceous (c. 110 million years), the Eocene

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[1] I. Velikovsky, *op. cit.*, pp. 219-220.

[2] *Ibid.* p. 220.

[3] *Ibid.*

[4] *Scientific American* (September 1989), p. 133.

[5] D. E. Hooker, *Those Astounding Ice Ages* (N. Y., 1958), p. 131.

epoch (c. 58 million years) and the Tertiary period of the Cenozoic era (c. 25 million years ago). Even if one were to drastically reduce these calculated millions of years, the fact remains that if Velikovsky's events took place they would have had to have taken place at least these many times. And that is not even counting the other epochs and eras during which coal is not presently known to have formed but during which stratified detritus was still laid down.

The vast amount of coal in the world can perhaps be appreciated by the fact that underground coal seams in Amidon, North Dakota, caught fire which could be seen burning through cracks in the earth. How long the fire had been burning is now questionable, but it definitely was already raging in 1898 and still burning by 1982. And that is only one of 260 such known fires burning in sixteen different U. S. states. Whether such burning coal fields are set aflame by lightning, prairie fires, man's own hand, or spontaneous self combustion, "they can smolder like a cigarette or become a raging blast furnace." Such fires have been known to burn for decades, although they can also burn for centuries. Millions of dollars have been spent in trying to put these fires out, but success has so dogged those who have tried that in one area an entire town had to be moved to escape one of these blazes. What is worse is that water pumped into the ground from above these fires tends to feed the fire rather than to douse it.[1] And this not only in North America. Northern China is covered with near-surface coal deposits, and these, too, have a tendency to ignite spontaneously. *Two hundred million* tons of coal have been calculated to be incinerated each year in this portion of the Chinese mainland alone.[2] Heaven only knows how many other coal fires are burning even now around the world. And this must have been going on since time immemorial. So how much coal does the world contain?

Despite his flaunted Biblical fundamentalism, Alfred Rehwinkel was right in drawing his readers' attention to the world's immense store of coal deposits:

> "Coal is found on every continent and on many islands of the sea. Some have more, others less, but there is sufficient coal stored below the surface of our earth to provide man with power, light, heat, and other substances derived from coal for hundreds of thousands of years. Lyell has estimated that the coal deposits in Nova Scotia alone are sufficient to provide a hundred million tons each year for fifteen thousand years, while the coal reserves of Alberta have been estimated at over 673 billion tons. This means that the coal mines of Alberta alone could supply the world with one million tons of coal annually for a period of 673,000 years. The coal deposits of North China are estimated at 150 billion tons. Add to this the coal reserves of the rest of the [north and south] American continents, of Europe, Asia, and the rest of the world, and our imagination fails even to comprehend the magnitude of the constructive work wrought in the most destructive event in the history of our globe."[3]

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[1] D. M. Kehrer, "The Earth is Burning," *Science Digest* (June 1982), pp. 28, 30; see also G. Garelik, "Inferno in the Earth," *Discover* (October 1983), pp. 18 ff.

[2] *New Scientist* (August 9, 1997), p. 49.

[3] A. M. Rehwinkel, *The Flood* (St. Louis, Missouri, 1951), pp. 197-198.

The "most destructive event" that Rehwinkel alludes to is the Biblical flood associated with Noah. While it is my hope that this particular flood will form the subject of a future volume in this series, I must here stake my claim that the Noachian deluge would neither have been the "most destructive event in the history of our globe," nor can it be held responsible for the formation of coal which was laid down long before the appearance of human beings. None of this should however detract from Rehwinkel's estimate of the world's coal reserves which, if anything, he understated. This then leads to the question: How many forests have gone into building all these coal seams? And, therefore, how great a cataclysm, or series of cataclysms, would have been needed to carbonize all those trees?

Regardless of *how long ago* coal was formed, that it itself did not require millions of years to form has been pointed out by many an investigator. According to Croll, it would only have taken about 5,000 years to form a seam one yard in thickness.[1] Otto Stutzer calculated that a seven-foot thick seam could have been formed in 2,100 years.[2] These spans, however, do not call for sudden catastrophic means. But then, as we have seen, modern timbers in a Pennsylvania coal mine have been coalified in as short a time as ten years.

All that aside, some catastrophists have suggested that coal might even be of extraterrestrial deposition. But, heavens!—some might exclaim. Is this not taking catastrophism too far? Can anyone conceive of coal falling from the sky? And billions of tons no less. Perhaps not coal itself, but the constituents which go into its formation have been theorized to be of cosmic origin by the best of orthodox scientists.

COSMIC PRECIPITATION

Does the above mean that trees, or at least vegetation of some sort, had also fallen from the sky? Of course not. But then where did the vegetable matter that formed coal come from if its other constituents were of cosmic origin? And yet, despite all that has been said above, has it ever been *proven* that Earth's coal fields were formed from the decay, incineration, and/or carbonization of vegetable matter? But what, then, of the fossil impressions of ferns, leaves, and the remains of other plants, that are frequently found in coal seams all over the world? Yet think about it: As Hooker was astute enough to point out,[3] vegetal fossils are also found imprinted in clay beds and other stony sediments. It does not prove that clay, sandstone, shale, and other minerals rich in plant fossils were themselves formed from the vegetal matter they contain. Why then coal?

But what, then, of those timbers that turned to coal due to a mine fire in Pennsylvania? Fine—there is no doubt that vegetal matter can turn into *coal-like* material. After all, as we have seen, artificial coal *is* produced from vegetal matter. But it is produced without burning anything and without the application of pressure. Only the application of heat is involved. And it is the heat from the burning fire that would have made the timbers in question *mimic* coal. Had the timbers burned, they would have turned to ashes. Remember Francis' point that

[1] J. Croll, *op. cit.*, p. 429.

[2] O. Stutzer, *The Geology of Coal* (Chicago, 1940), p. 397.

[3] D. E. Hooker, *op. cit.*, p. 130.

the carbonization of burned trees could only have occurred if the burning had been checked *before* the total destruction of the forests.

The one thing to keep in mind, however, is that the main constituent of coal is carbon. Carbon is found throughout the world in other compositions besides coal. Graphite is one of them. In fact graphite consists of crystallized carbon. Some of this mineral has also been claimed to have derived from vegetal matter, but only because some graphite veins have been discovered in association with coal.[1] After all, graphite is also found embedded in granite, gneiss, and even contained in meteoric irons. This graphite, it has been stated, could not have been of organic origin.[2] Neither could those graphite veins which have been dated to the earliest geological eras long before vegetation is supposed to have made its first appearance. But graphite being graphite, how could it have different origins?

It was thus Hooker's belief that carbon fell from Earth's primordial atmosphere.[3] And if, as we have seen in our previous volume, diamond dust could have fallen to Earth from cosmic regions,[4] why not carbon dust? Are not diamonds themselves composed of crystallised carbon?

Although Hooker might have been mistaken concerning its actual source, he was not to remain alone in his contention that carbon fell to Earth from the sky. In 1977, Thomas Gold, himself an astronomer, also challenged the theory which claims that fossil fuels, including coal, are the product of biological processes, even if the geological community paid him but little heed.[5] What he claimed instead is that Earth's hydrocarbons—not just coal, but also oil—"are extraterrestrial in origin, born in interstellar clouds and carried to Earth by meteoroids and/or comets."[6] (And was not Velikovsky laughed at when he suggested a similar origin for hydrocarbons in general and oil in particular?)

Actually, the existence of carbon compounds in comets had been known through the spectral studies of William Huggins since 1881. Even at that early date, Huggins was already arguing for the cometary existence of hydrocarbons.[7] That carbon and hydrocarbons form part of the constituents of comets is now an accepted tenet of astronomy.[8]

Gold reasoned that hydrocarbons, whether derived from comets or not, would have already been present in the solar nebula from which Earth was believed to have formed. Basing his theory on the new paradigm which itself claims that Earth aggregated from smaller solids and that it was never a molten sphere, his belief was that our planet would have swept these hydrocarbons and stowed them in its interior. Later, these low-weight hydrocarbons would have gradually floated upwards towards the surface where they are presently found.[9] But since

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[1] L. J. Spencer, "Graphite," *Encyclopaedia Britannica* (1959 edition), Vol. 10, p. 645.

[2] *Ibid.*

[3] D. E. Hooker, *op. cit.*, p. 132.

[4] *Flare Star*, pp. 430 ff.

[5] S. Kwok, "Mining for Cosmic Coal," *Astronomy* (June 2002), pp. 46, 50.

[6] *Ibid.*, p. 46.

[7] C. Sagan & A. Druyan, *Comet* (N. Y., 1958), p. 143.

[8] F. G. Graham, "Comets in Perspective: What the Comet Halley Probes Tell Us," *HORUS* II:2 (Summer 1986), p. 10.

[9] S. Kwok, *loc. cit.*

in our own scheme carbon would have been laid on Earth in ages prior to the proto-Saturnian system's entry into the Sun's domain, any hydrocarbons in the solar nebula would not have participated in Earth's accumulation of carbon.

But could Earth really have received its burden of carbon by passing through the tenuous tails of comets? When Earth passed through the tail of the Great Comet of 1861, no carbon, as dust or otherwise, is known to have precipitated to Earth. But what of direct cometary impacts? Well, there is no doubt that such impactors would have released not some, but all, their carbon content into the air, which carbon would eventually have settled down on Earth's surface. But it is doubtful that even this would have resulted in the accumulated amount of carbon contained in Earth's sandwiched coal seams, to say nothing of graphite and other carbon-based minerals. One would have to ask for multiple bombardments from a veritable rain of comets, and this would have to have been repeated time and again. What this would then call for is for Earth to have passed through various cometary fields. Do such cometary fields exist in outer space through which the proto-Saturnian system could have passed on its way to the Sun's domain of influence?

Interstellar comets had been proposed in 1806 by Laplace even though there was then no hard evidence for their existence. Such comets have now not only been detected but even photographed.[1] And while these comets are associated with stellar nebulae, some of them have been claimed to be contained within the arms of our galaxy.[2] If, as Victor Clube and Bill Napier noted, it is inevitable that the Solar System would have encountered these comets as it passed through one of the galaxy's spiral arms,[3] it could just as easily be argued that so, also, might the proto-Saturnian system have. But if interstellar comets is where Earth's hydrocarbons were derived from, the next question to ask is where did these comets themselves obtain their load of these organic compounds?

CARBON STARS

Carbon stars are believed to be old stars nearing the limit of their life at which time they turn carbon atoms into molecules. Combing these molecules with those of hydrogen, they then produce hydrocarbons. As these stars continue to age, they tend to "fertilize the galactic environment with the release of large quantities of [these] organic compounds."[4] One of these stars, labeled CW Leonis, has been calculated to eject "trillions of tons of carbon monoxide molecules into space every second."[5] And this, as Sun Kwok reports, "is only one of many thousands of other similar stars 'polluting' the Milky Way Galaxy at this very moment."[6]

Also, the nebula known as NGC 7027, which is said to have evolved out of a carbon star, is chockfull of chemical emissions which have been found to constitute aromatic compounds which contain hydrogen and carbon atoms. Since aromatic compounds are not themselves

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[1] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 36.
[2] *Ibid.*, p. 40.
[3] *Ibid.*
[4] S. Kwok, *op. cit.*, p. 48.
[5] *Ibid.*
[6] *Ibid.*

found in carbon stars, it has been deduced that "these compounds are born in the diffuse clouds surrounding the stars." But because it is now believed that, at best, "only a few thousand years separate the stages of a carbon star and [what is normally termed] planetary nebulae," these aromatic compounds "must have been transformed from simpler molecular forms over a similar, astronomically brief, timescale." As we have already seen, misnamed protoplanetary nebulae—that is circumstellar disks—are now believed to "evolve rapidly and exist a mere one thousand years."[1] However, the "incredibly high ejection rates" of these and other molecules from such stars has been interpreted to mean that "they are synthesized and replenished on time scales of *just a few hundred years*."[2] Moreover, intense ultraviolet radiation from the parent star is held responsible for reorganizing the original chemical structures into aromatic substances.[3]

But what is all this leading to? That is what Renaud Papoular and his colleagues set out to find out. It did not take long for this group of scientists from the Atomic Energy of France to realize that the aromatic structure of these galactic compounds compares quite well with that of coal. "Coal is composed of a mixture of aromatic rings and aliphatic chains," writes Kwok, "and its black color also correlates well with our findings." Moreover, Papoular's team "is particularly interested in relating some astronomical results to kerogens—insoluble, tar-like, organic compounds distributed in rocks—which are thought to be the likely source of fluid hydrocarbons such as oil." [4] As Kwok continues, "even if the mystery substance we observe [in these nebulae] is not coal, *it must be something shockingly similar*."[5] One thing that the scientists concerned with this study are certain of is that "the creation of complex organic molecules is no longer the sole domain of Earth."[6]

"Because the solar system was created from an interstellar cloud," it has therefore been conjectured, "Earth may well have inherited some of these hydrocarbon-rich materials."[7] But since, in our own scenario, Earth would have come into being outside the Solar System, it could not have inherited its store of carbon compounds from this particular interstellar cloud. Moreover, an early objection to Gold's theory centered around the fact that primordial gas in the form of simple hydrocarbons would be unlikely to survive the high temperatures that would have been generated in the process of accretion during Earth's formation. Gold, however, was not at that time aware that "stars can manufacture organic matter as complex as kerogen." As Kwok explains: "Solids like kerogen are certainly more resilient than any gas, and have a much greater chance of surviving the violent physical forces involved with our planet's birth."[8] But it is unlikely that this would even apply to the orthodox scheme since it is

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[1] *Ibid.*, pp. 48-49.

[2] *Ibid.*, p. 48 (emphasis added).

[3] *Ibid.*, p. 49.

[4] *Ibid.*

[5] *Ibid.* (emphasis added).

[6] *Ibid.*, p. 50.

[7] *Ibid.*, p. 48.

[8] *Ibid.*, p. 50.

more than evident that most of Earth's supply of hydrocarbons accumulated long *after* the Earth's formation as a planet.

Again, in order to explain the formation of coal from his simple hydrocarbons, Gold had theorized that micro-organisms, such as bacteria, deep within Earth's interior may have played a role in converting the gaseous substance into coal through hydrogen extraction. "But if kerogen is indeed an early earthly stowaway," argued Kwok, "then this hypothesis is unnecessary" since coal would have evolved from kerogen "through the natural loss of hydrogen, oxygen and nitrogen." Petroleum, in fact, is often found in "sedimentary rocks rich in kerogen and is believed to simply degrade from kerogen over time."[1] But here, again, the catch-phrase is "sedimentary rocks" which, needless to say, would have had to have been deposited long after Earth's formation.

One question raised, and answered, by Kwok was whether there is enough "celestial organic matter to account for Earth's known reserves of coal, oil, and gas." The answer seems to be in the affirmative because present estimates indicate that carbon stars manage to "pump out" these organic compounds in a mass equivalent to that of the Sun *each terrestrial year.*[2] Despite the immense quantities of coal on Earth we alluded to above, on a planetary scale these carbon veins represent the thinnest of veneers. Kwok is thus of the opinion that even if a small fraction of these hydrocarbons is in the form of organic matter, it would total about "a trillion Earth-masses" over "the several-billion-year lifetime" of our galaxy.[3] And a good share of these compounds would have ended up on Earth, *regardless of whether our planet was, or was not, a member of the Solar System from its inception.*

Even so, there are still problems yet to solve. And one of prime importance concerns the stratified nature of coal deposits. It is not enough for us to claim that Earth's carbon-based minerals could not have originated deep within Earth's interior while it was still forming. As we have seen, the evidence that comes our way through coal seams not only calls for catastrophic measures, but recurring ones at that. Thus, if this theorized organic matter fell to Earth it would have to have fallen periodically. We would not otherwise find coal in stratified seams sandwiched between strata of uncarbonized material.

What, then, can we think of? The far-fetched supposition of a nearby carbon star that turned its organic production on and off? One might better be inclined to reconsider the role of interstellar comets. The problem here is that these denizens of deep space are nowhere near the size of our more familiar hairy stars. Take the ones thousands of which encircle the central star in the Helix Nebula. Referred to by orthodoxy as "cometary knots," each one of them has a nucleus that is about twice the diameter of our entire Solar System and a tail that stretches to a hundred-billion miles. The proto-Saturnian system could not have come anywhere close to one of these colossi without its linear configuration being disrupted, even if it only passed through its enormous tail. One even wonders if such a passage would have allowed the system to survive annihilation.

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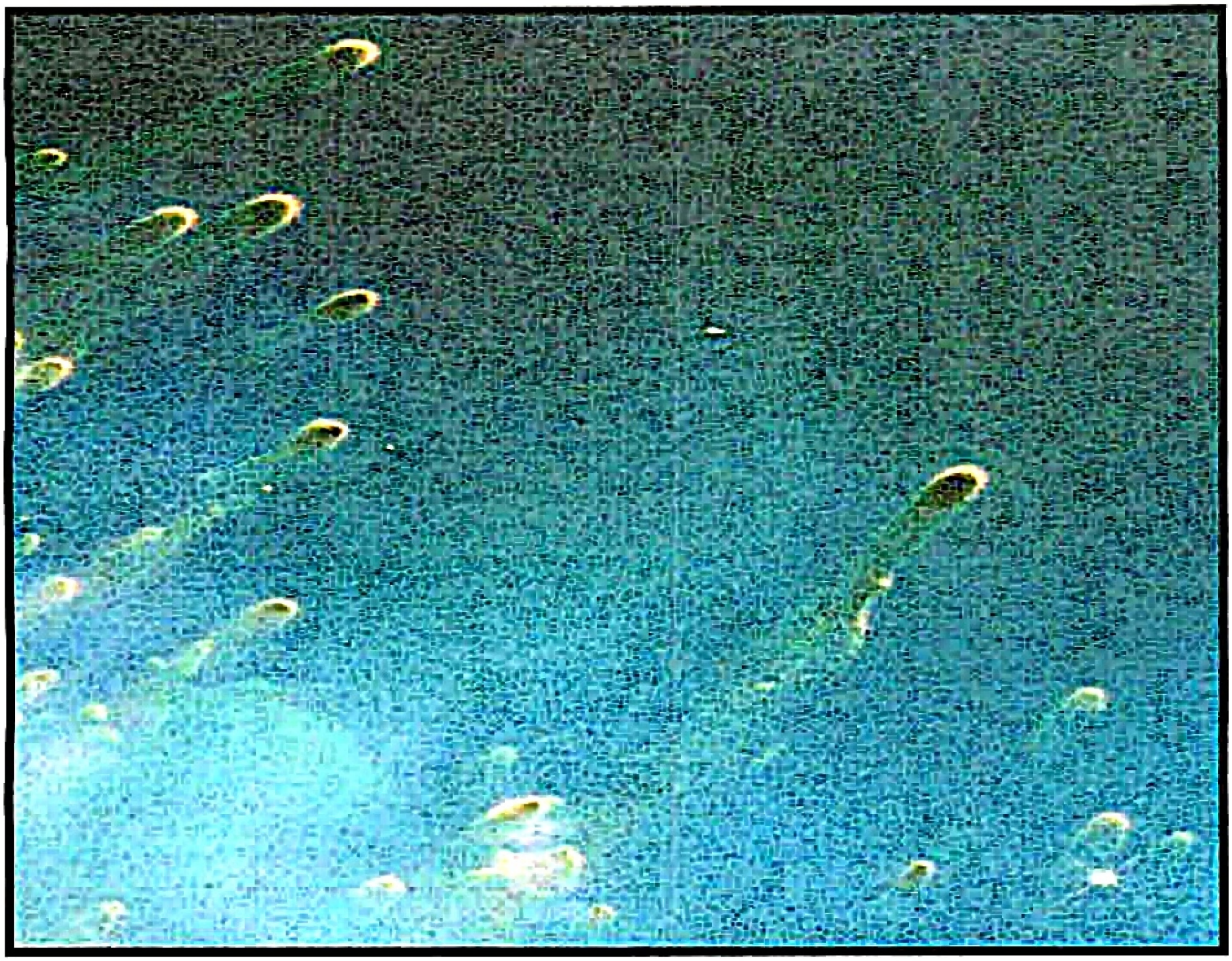
[1] *Ibid.*

[2] *Ibid.*

[3] *Ibid.*



The interstellar comets of the Helix Nebula, each with a nucleus that is twice the diameter of the Solar System and a tail that stretches for a hundred billion miles.
(Photograph courtesy of NASA.)

It therefore seems that we are left with nothing except a carbon source that would have to have been not only close to Earth, but part and parcel of the system in which it abided. Under the accepted scheme, this would have been the Sun itself. The Sun, however, is not yet nearing the end of its life so that it cannot act as a carbon star, let alone having done so in the past. In our case, the source would have been the previous proto-Saturnian sun which, as a sub-brown dwarf, might very well have been nearing the end of its life as a stellar body. But could such a diminutive star have served as a carbon factory? After all, the carbon stars we have just discussed began their life as Sun-sized bodies which developed into red giants before they turned into carbon plants.[1]

And yet, as in everything else in the Universe, cosmic bodies come in various sizes. As

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[1] *Ibid.*, p. 48.

Alan MacRobert noted, "astronomers [had] long assumed that every carbon star had to be a giant."[1] But, as has often been the case, that belief was shot down by the 1977 discovery of a dwarf carbon star. At first, astronomers reasoned that this had to be "some kind of fluke." Since then, however, many more dwarf carbon stars have turned up. Some of them have been discovered above the plane of the Milky Way. More than that, it was soon realized that "the numerical majority of stars with C_2 in their spectra are dwarfs, not giants." But because red dwarfs are believed not to have evolved enough to produce carbon, it was reasoned that the carbon had been dumped on them from close companion stars which existed with them in a binary system. Yet none of these dwarfs are accompanied by partner stars. On the contrary, all of them are lone travelers in space showing rapid proper motion across the sky. In the end, as always, astronomers were left with no option but to invoke what was not there. The companion stars, it has been claimed, "have since shrunk and faded to invisibility." And, to be sure, one of these dwarfs—G77-61 in the constellation Taurus—has been claimed to be orbiting around an unseen "something" with a star-like mass. This has been deduced from the dwarf's changes in its radial velocity.[2] One cannot however help noting that astronomical riddles are much too often put to rest by the ad-hoc introduction of "unseen somethings."

It should, however, be pointed out that other dwarf carbon stars show no such changes in their velocity and could not therefore be orbiting anything. Besides, is it conceivable that there would be more carbon stars among the dwarfs than the red giants?

PLANETARY HYDROCARBONS

In our particular case the question revolves around whether proto-Saturn ever contained carbon and/or hydrocarbons and, on this issue, there seems to be no doubt. The presence of hydrocarbons in the atmosphere of the planet Saturn was verified in 1982.[3] By 1986, Thomas Gold could write that: "The viewpoint that hydrocarbons could not arise without biology became quite untenable when astronomers discovered that hydrocarbons are the most common form of carbon in the solar system."[4] Not only Saturn, but Jupiter, Uranus, and Neptune have been found to "contain *enormous amounts* of methane and other hydrocarbons in their atmospheres."[5]

So, similarly, on Titan, Saturn's largest moon, despite the controversy which attended the exceedingly confident interpretation of the early evidence. The presence of hydrocarbons in Titan's atmosphere, now verified by the Cassini spacecraft discoveries,[6] had long been suggested through infrared images of the satellite.[7] This was interpreted to mean that Titan's clouds could "burst open with showers of liquid hydrocarbons."[8] In turn, this led to the

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[1] A. MacRobert, "Dwarf Carbon Stars," *Sky & Telescope* (February 2003), p. 22.

[2] *Ibid.*

[3] *Science* "Special Saturn Issue" (January 29, 1982), p. 500.

[4] T. Gold, *New Scientist* (June 26, 1986), p. 42.

[5] *Ibid.* (emphasis added).

[6] R. Naeye, "A Flood of Cassini Discoveries," *Sky & Telescope* (March 2005), pp. 16, 17.

[7] K. A. Svitil, "Titan's Time Warp," *Discover* (June 2002), p. 52.

[8] *Ibid.*

conclusion that "a layer of hydrocarbons, *perhaps half a mile deep*, covers most of Titan."[1] Right from the start, however, scientists were faced with the problem of how Titan could have sustained an atmosphere rich in methane so long after the satellite's formation. Titan's atmospheric methane, as one report put it, should have vanished "billions of years ago because methane is destroyed by ultraviolet sunlight."[2] Titan's methane, it was then argued, must therefore be replenished by erupting surface geysers or volcanoes.[3] The accumulated methane, it was still believed, would then rain down "in a matter of hours or a few days."[4] This was said to have been confirmed by Huygens' sensors which "picked up evidence of methane droplets" during its descent to Titan's surface.[5] But, as usual, of consensus there was none since others have claimed that Titan's methane rain comes down in torrents only *once every thousand years*.[6]

While Titan's gravity is only one seventh as strong, its atmosphere is far denser than Earth's.[7] However, billions of years ago, according to Margaret Tolbert and her colleagues at the University of Colorado, Earth may have been shrouded in a blanket of atmospheric haze very much like Titan's[8]—which cannot fail but remind us of past theories which have vouched for an Earth which was burdened with a much denser atmospheric envelope. And this, it has been claimed, might have provided the "organic material" that nourished Earth's earliest life forms.[9] In fact, Titan's atmosphere and terrain have lent themselves to a comparison of the satellite with our own world as it might have been in its primordial youth.

That Titan is presently manufacturing its own hydrocarbons through the injection of methane by surface geysers and/or volcanoes still needs to be ascertained. In our opinion Titan could very well have received its atmospheric burden of methane from its parent planet Saturn very much as Earth would have done. The reason Titan's methane has not broken down in ultraviolet sunlight is because Titan's accumulation of Saturnian methane did *not* take place billions, but only a few thousand, years ago. To be sure, at least as of this writing the theorized half a mile deep layer of hydrocarbons in seas, lakes, or rivers on Titan's surface have not yet come to light as neither have methane rains of any duration. But if it can be assumed that hydrocarbons *can* rain down on Titan, there is nothing improbable in our own hypothesis that hydrocarbons have precipitated to the ground in Earth's primordial past.[10]

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[1] *Ibid.* (emphasis added); see also C. Jozefowicz, "The Methane Seas," *Scientific American* (December 2003), p. 46.

[2] J. N. Wilford in the Science Section of *The New York Times* (October 25, 2005).

[3] *Ibid.*; R. Naeye & D. Tytell, "Titan Revisited," *Sky & Telescope* (March 2006), p. 16; K. S. Chadha, "Titan's Exploding Ice," *Astronomy Now* (April 2006), pp. 26-27.

[4] J. N. Wilford, *loc. cit.*.

[5] A. Boyle & K. Grimes, "The Music of the Spheres," *Astronomy* (December 2005), p. 37.

[6] B. Douthitt, "Beautiful Stranger: Saturn's Mysteries Come to Light" (but shown as "Voyage to Saturn" in the Contents page), *National Geographic* (December 2006), pp. 48, 54 (emphasis added).

[7] A. Stone, "Life's a Beach on Saturn's Moon," *Discover* (August 2006), p. 16.

[8] Reuters, "Hazy Titan May Hint at Earth's Early Climate," CNN.com (November 14, 2006).

[9] *Ibid.*

[10] NOTE: The presence of hydrocarbons in the atmosphere of the planet Venus will be considered in a future volume of this series.

Tar-like organic substances and kerogens have also been surmised as some of the constituents of asteroids as well as comets.[1] Here on Earth tar is artificially produced through the distillation of hydrocarbons and other organic substances including coal. Another tarry substance is asphalt which occurs naturally in surface lakes and as impregnation in sub-surface rocks such as sandstone and limestone throughout the world. Naturally occurring asphalt lakes have been known since ancient times and are found mentioned in various ancient tracts.[2] One of the most famous of such regions is the Dead Sea in which masses of bitumen, some "as big as houses," continue to rise to the surface from time to time. That the bitumen of the Dead Sea was much more predominant in ancient times is evidenced by the fact that it was formerly known as Lake Asphaltites.[3] In North America, the tar sands of Alberta are claimed to hold more recoverable oil than the deserts of Saudi Arabia.[4] Perhaps better known are the so-called La Brea Tar Pits in Los Angeles, California, from which thousands of Pleistocene animal remains have been exhumed.

Asphalt, however, is also artificially derived through the distillation of that form of hydrocarbons known as petroleum, the very oil that fuels all those millions of cars and other engines which are presently contaminating Earth's entire atmosphere. Even in its natural state, asphalt is believed to be derived from the natural distillation or the partial evaporation of petroleum. But how is petroleum itself derived?

The textbook version,[5] as also that of oil companies,[6] is that oil was formed from the remains of tiny plants and the bodies of billions of animals that lived in the sea hundreds of millions of years ago. In dying, these organisms sank to the bottom where they decomposed to be mixed with the mud and sand that formed marine sediment. These sedimentary layers were themselves covered with more sand and mud which, through pressure, finally metamorphosed into hard rock while the decomposed organic bodies turned into oil. With the withdrawing of these archaic seas and the tectonic uplift of Earth's crust, immense pockets of the resulting petroleum ended up beneath the land both far inland and underneath the continental shelves.

The above theory traces back to S. Volta, an obscure priest who, in 1781, explained petroleum as the "fermentation of buried animals and plants."[7] In 1923, J. M. MacFarlane, who was Professor of Botany at the University of Pennsylvania, restricted the formation of petroleum solely to fish which, in his opinion, were "destroyed in prodigious numbers somewhere in the distant past." As he wrote: "In review of the evidence...the author was compelled to accept that fishes are the source of practically the entire supply of crude petroleum, also of natural petroleum derivatives like asphalt."[8]

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[1] "Tar-Like Molecules Colour Asteroids," *New Scientist* (February 28, 1980).

[2] See here, for instance, Eusebius Pamphilii, *Evangelicae Praeparationis*, IX: ix: 412c.

[3] D. B. Vitaliano, *Legends of the Earth* (London, 1973), p. 90.

[4] E. Kiester, Jr., "Paydirt," *GEO* (December 1980), pp. 67, 78.

[5] See, for example, the entry for "Petroleum," in the 1959 edition of *Encyclopaedia Britannica*, Vol. 17, p. 656.

[6] M. Johnson, "The Origin of Oil," *Chevron World* (Fall 1985), pp. 10-12.

[7] *Ibid.*, p. 12.

[8] J. M. MacFarlane, *Fishes: The Source of Petroleum* (N. Y., 1923), p. 14.

The problem with this scenario is that dead fish do not usually decompose, definitely not in the number required to produce oil, but are rather devoured by different fish and other marine animals—that is unless millions of them were to simultaneously meet a sudden death and be instantly buried. And, to be sure, that is the evidence derived from an untold number of fish cemeteries. As MacFarlane himself noted:

> "It can be definitely said that through all of the geologic formations in which fish remains occur, the large proportion of the remains consist of entire fishes or of sections in which every scale is still in position; every fin is extended as in life attitude; the bones of the head, though often crushed in and broken through subsequent diastrophic strains, still retain almost the normal positions; while near them may be coprolites of the same or some other types of fish in a practically entire state. All of this conclusively proves that when myriads of such fishes were simultaneously killed, their bodies were deposited or stranded within a few hours or a few days at most after death, so that the flesh, the liver, the alimentary canal, and other soft parts were unquestionably enclosed and intact when sediment sealed them up."[1]

This situation is quite evident from the remains embedded in the Old Red Sandstone which comprises just about one half of Scotland. In the words of Hugh Miller, who made a special study of the subject, this vast area, which stretches from Loch Ness to the Orkney Islands, represents "a wonderful record of violent death falling at once, not on a few individuals, but on whole tribes."[2] Thus Miller's verdict was that "some terrible catastrophe" was involved in the "sudden destruction" of the fish in this area which stretched "at least a hundred miles from boundary to boundary, perhaps much more."[3] As he goes on:

> "The same platform in Orkney as at Cromarty is strewed thick with remains [of fish], which exhibit unequivocally the marks of violent death. The figures are contorted, contracted, curved; the tail in many instances is bent around to the head; the spines stick out; the fins are spread to the full, as in fish that die in convulsions. The [now extinct] Pterichthys shows its arms extended at their stiffest angle, as if prepared for an enemy. The attitudes of all the ichthyolites on this platform are attitudes of fear, anger and pain. The remains, too, appear to have suffered nothing from the after-attacks of predaceous fishes; none such seem to have survived. The record is one of destruction at once widely spread and total."[4]

We could go on describing similar situations from Monte Bolca in Italy; the Harz Mountains of Germany; from Switzerland; Ohio; Michigan; the Green River in Arizona; Lompoc in California; and elsewhere in various other countries. In all these cases the remains of untold

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[1] *Ibid.*, p. 400.
[2] H. Miller, *The Old Red Sandstone* (Boston, 1865), p. 48.
[3] *Ibid.*, p. 222.
[4] *Ibid.*

number of fish have been preserved in whole or in part, in attitudes of agony, etched in the rock with no signs of putrefaction. None of them turned into petroleum.

And yet, as George McCready Price noted: "In many places in America as well as in Europe where remains of fish are found, the shaley rock is so full of fish oil that it will burn almost like coal, while some scientists have even thought that the peculiar deposits like Albertite 'coal' and some cannel coals were formed from the distillation of the fish oil from the supersaturated rocks."[1]

But is it really fish oil, or is it oily shale in which the remains of fish are also entombed? As noted above, one of these fish cemeteries occurs in the Harz Mountains of Germany, concerning which W. Buckland wrote: "As these fossil fishes maintain the attitude of the rigid state immediately succeeding death, it follows that they were buried before putrefaction had commenced, *and apparently in the same bituminous mud, the influx of which had caused their destruction*."[2] Could it not therefore have been that the constituents which form petroleum had *already* been contained in this "bituminous mud"?

Or let us look at this another way. The most celebrated remains of fossil fish in Europe are those of the Saarbrücken in Germany. But these are found in coal formations.[3] Does that mean that the coal in question was formed from the remains of unspoiled fish? Can coal be formed from fish? Or is it that the bituminous substance that went into the formation of coal *also* entombed the fish found in it? But then where did the bituminous substance come from?

One source of petroleum discovered in the late 1970s was seepage from ocean bottoms.[4] By the early 1980s, this seepage was traced to areas close to hydrothermal vents. The first studies were conducted in the southern oceanic rift of the Guaymas Basin in the Gulf of California, which rift is known to be still spreading. Hydrothermal mounts 2,000 or so meters below the surface along this rift rise up to 30 meters above the rift. Unconsolidated sediments are also to be found along the rift into which lava is continuously being injected. It has therefore been conjectured that the seeping petroleum is being formed through thermal alteration, condensation, and solution of the dead organic matter—plankton, microbes, and so forth—which collects in these sediments.[5] The outflow of hot water assists this "hydrothermal petroleum" to be buried by new sediments.[6]

This led the biologist William Smithey, then at the Scripps Institution of Oceanography, to claim that the discovery of hydrothermal petroleum shatters the belief that oil took *millions* of years to form through the decay of land creatures and plants. The hydrothermal vents, according to Smithey, would act like a pressure cooker to speed up the formation of petroleum, but that it would still have taken *thousands* of years.[7] Steve Scott, then at the University of

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[1] G. McCready Price, *Evoltionary Geology and the New Catastrophism* (Mountain View, California, 1926), pp. 235 ff.

[2] W. Buckland, *Geology and Mineralogy* (Philadelphia, 1837), p. 103 (emphasis added).

[3] I. Velikovsky, *op. cit.*, p. 21.

[4] AP Wire Service, "Oil 'Spills' Natural Phenomena," *Ottawa Citizen* (October 16, 1979), p. 39.

[5] B. R. T. Simoneit & P. F. Lonsdale, "Contemporary Cataclysmic Formation of Crude Oil," *Nature* (January 21, 1982), pp. 198-202.

[6] A. S. Mackenzie, "A Hydrothermal Plume Remobilizes Sedimentary Organic Matter," in *ibid.*, p. 187.

[7] *Ottawa Citizen* (January 29, 1982), front page.

Toronto, threw in his two cents by claiming that the heat from hydrothermal plumes would themselves act to refine this oil into asphalts, gasolines, etc.[1]

It might be argued that hydrothermal vents are short-lived phenomena which last no more than about a hundred years. When they go out, life around them simply dies off. So how could it take thousands of years to form petroleum through the action of these short-lived vents? The answer, we were told, is simple enough in that as these vents go out, others are created to take their place. Walter Sullivan then weighed in by suggesting that major oil deposits could have been created hydrothermally as the continents split to form narrow seas like the Gulf of California.[2]

A similar theory was later advanced by Roger Larson who hailed from the University of Rhode Island. During the Middle Cretaceous, according to him, Earth's crustal plates speeded up, forcing the South Atlantic to open up "like a zipper, from south to north." Floods of basalt then poured out together with "a global surge of volcanic eruptions, both at plate boundaries and in plate interiors," all of which was caused "directly or indirectly, by plumes of hot rock rising from the bottom of Earth's mantle." These eruptions added a considerable amount of carbon to the ocean from where it supposedly made its way into the atmosphere and was thus responsible in raising Earth's temperature. This warm climate then "produced a boom in phytoplankton—the tiny plants that float in the sea." The corpses of this renewed marine life accumulated on the floor of shallow seas "well above the depth at which high pressure would dissolve them." It was this organic substance, "buried and cooked for millions of years," that was eventually "converted into vast pools of oil."[3]

Not only was this a re-cooking of the same old theory under a different fire, it took the formation of petroleum back to millions of years.

There were, however, dissenting voices and not merely against the notion of millions of years, but against the theory of petroleum's organic genesis as a whole. For one thing, as Gold reported: "The quantities of oil and gas that geologists eventually found turned out to be hundreds of times larger than initial estimates, based on the assumption of biological origin."[4] Although quaintly phrased, Frederic Jueneman was right on target when he opined that "over the past hundred years we've found so much oil [to say nothing of coal and gas], and suspect the presence of many times more potential deposits than what we've located so far, that there ain't been enough dinosaurs and plants to give their all for even a fraction of the amount recoverable."[5] And then, to top it all, oil was discovered in Australian rocks which are believed to have formed so geologically early that life forms for its formation had not yet evolved sufficiently.[6] Thus, for instance, oil was not expected in Precambrian strata and geologists did not look for it. But there it is, and in vast quantities.[7]

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[1] D. York, *Globe and Mail* (February 1, 1982).

[2] W. Sullivan, *New York Times* (January 29, 1982).

[3] E. Dobb, "Hot Times in the Cretaceous," *Discover* (February 1992), p. 13.

[4] T. Gold, *loc. cit.*

[5] F. B. Jueneman, "Pleiongaea: A Myth for All Seasons," *AEON* II:3 (1990), p. 50; *idem*, *Raptures of the Deep* (Des Plaines, Ill., 1994), p. 49.

[6] *New Scientist* (January 10, 1998), p. 13; *ibid.* (March 14, 1998), p. 22.

[7] *Science Frontiers* (September-October 1998), p. 3.

The "blind acceptance" of the organic theory, according to V. Porfirev, has "been a waste and a failure."[1] He further adds that:

> "...the organic theory of the origin of petroleum does not correspond to the modern state of knowledge in the fields of geology, geochemistry, geophysics, thermodynamics, astrophysics and other sciences; in fact, it is an outdated concept. Instead, the general inorganic theory of petroleum meets the requirement of the new knowledge completely."[2]

What, then, is "the general inorganic theory of petroleum"?

Without going into complex technicalities, this theory, as proffered by Gold, assumes that the non-biological hydrocarbons—similar to the tarry matter found in some meteorites—that were inherited by Earth during its formative period would eventually have degassed into the atmosphere in the form of methane through volcanic eruptions. This would have provided the atmosphere with carbon dioxide which, in its turn, would have dissolved and precipitated into the oceans as calcium carbonate. Under heat and pressure, to say nothing of catalytic action, this mess would eventually have transformed itself into crude oil.[3]

Thus, for instance, the North Sea bottom consists of basalt and not the sedimentary rock from which oil is expected to be extracted. "The early predictions were that the North Sea was a hopeless location for petroleum," Gold informs us, "and it is said one advisor told the British Government that he would drink every cup of oil that was obtained out of the North Sea."[4] It is not said how many cups of oil this advisor was forced to drink when the North sea gave up its oily burden.

But if petroleum does not derive from organic substances, why does some of it contain bacterial remains? This conundrum led Gold to posit that petroleum has a dual origin. A smaller quantity, according to him, *is* derived from buried organic sediments. But this, still according to him, would have been augmented by a much larger amount of non-biological methane.[5]

Six years later, however, Gold had a change of mind. The conclusion he came to by then was that the bacterial remains found in petroleum must simply constitute contamination from bacteria feeding off the oil which was there in the first place.[6] After all, as we have already seen, shale and limestone also contain the remains of marine life. It does not mean that these stones were *composed* from such organisms. Could it not have been likewise with petroleum? Could it not be that the constituents which went into the formation of inorganic petroleum have additionally buried organic matter in the process? Take the tar sands of Alberta, for instance, which are only part of a worldwide distribution the largest of which deposits are to be found in the Orinoco River basin of Venezuela. Similar substantial deposits also occur in Tur-

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[1] In full in *American Association of Petroleum Geologists Bulletin* 58 (1974), pp. 3-33.

[2] *Ibid.*

[3] T. Gold & S. Soter, "The Deep-Earth-Gas Hypothesis," *Scientific American* (June 1980), pp. 154-161.

[4] *Idem, Power from the Earth* (London, 1987), p. 128.

[5] *Idem*, "The Deep-Earth-Gas Hypothesis," see reference # 115.

[6] *New Scientist* (June 26, 1986), pp. 42-46; *ibid.* (September 11, 1986), p. 26.

key, the Balkans, Russia, and Malagasy, with much smaller reserves in the United States.[1] All of these tar sands consist of sand, water, and bitumen from which the oil is extracted.[2] The ones in the Athabasca region of Alberta are easier developed because the deposit lies close to the surface, with most of it less than 150 feet underground. In fact, outcrops of the deposit can be seen oozing out of the ground in many places along the Athabasca River.[3] Moreover, the remains of "logs, leaves and fish teeth" have been found in these oily sands, but none of them are fossilized.[4] These deposits could not therefore have been laid down at any great depth and, therefore, the biological remains found embedded in them could not have been metamorphosed into oil through heat and pressure. It is more likely that these unfossilized remains represent bits and pieces from the periodic flooding of the Athabasca that became trapped in the tarry sands. Thus, despite his status as the excavation director of the Provincial Museum of Alberta, in Edmonton, Philip Currie's 1981 hope of someday finding a dinosaur preserved in these tar sands[5] is not ever likely to be realized.

B. Rahmer was another authority who attempted to bring the inorganic origin of petroleum to the scientific establishment's attention. "It should...be noted that non-organic theories were quite in fashion during an earlier stage of the development of the science of geology," he wrote, "and, more to the point, that a minority of responsible scientists has always remained sceptical of the now prevailing organic theory, among them the noted British chemist and Nobel laureate Sir Robert Robinson."[6] Moreover, as Rahmer continues to tell us: "Quite recently, Dr. Richard R. Donofrio of American Ultramar Ltd. has expounded his own partially non-organic theory according to which oil pools in North America may have been formed by meteoric impact in Paleozoic sediments..."[7] A. T. Wilson, too, was of the opinion that all of Earth's burden of oil is of extraterrestrial origin.[8] And, as far as J. Oro and J. Han were concerned, petroleum could easily have been formed through the interaction of comets with planets.[9] B. Y. Levin was also of the belief that "hydrocarbons in cometary heads must have played a part in forming petroleum..."[10] T. Link was of a similar opinion, but went a step further by positing that those meteorites in which petroleum residues have been detected might possibly be the remnants of a former planetary body which somehow disintegrated.[11]

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[1] E. Kiester, Jr., *op. cit.*, p. 79.

[2] *Ibid.*, p. 80.

[3] *Ibid.*

[4] G. Olshevsky, "Dinosaur Renaissance," *Science Digest* (August 1981), p. 43.

[5] *Ibid.*

[6] B. A. Rahmer, "Need to Investigate Deep-Earth Gas," *Petroleum Economist* (August 1981), pp. 348-351.

[7] *Ibid.*

[8] A. T. Wilson, "Origin of Petroleum and the Composition of the Lunar Maria,"*Nature* (October 6, 1962), pp. 11-13.

[9] J. Oro & J. Han, "High-Temperature Synthesis of Armomatic Hydrocarbons and Methane," *Science* (September 16, 1966), pp. 1393-1395.

[10] B. Y. Levin, "The Interaction of Astronomy, Geophysics and Geology in the Study of the Earth," in *"The Interaction of Sciences in the Study of the Earth* (Moscow, 1968), p. 178.

[11] T. A. Link, "Whence Came the Hydrocarbons?" *Bulletin of the American Association of Petroleum Geology*, Vol. 41 (1957), pp. 1387-1402.

Gold was so sure of this general hypothesis that he finally went out on a limb by predicting that oil can be found beneath the ground in meteoric craters. While no one in North America paid him much heed, it was different in Europe. And, to be sure, natural gas and oil *were* discovered beneath a meteoric crater in Sweden.[1] There was, however, so little of the stuff that drilling for it was deemed commercially unprofitable. And when one thinks of the small amount of hydrocarbon derivatives that a meteorite might contain, the result of this experimental drilling is quite understandable. But therein lies the problem with all theories claiming a meteoric and/or cometary origin of Earth's petroleum. The vast quantities of oil so far discovered on Earth, to say nothing of potential future discoveries, speaks against the possibility of the origin of petroleum through the impact of meteorites and/or comets. Such astronomical quantities of petroleum would have required so many impacts they would have fractured Earth out of near existence. So, likewise, with an origin that calls for Earth's passage through the tails of comets, à la Velikovsky. Any hydrocarbons in the tails of comets would have been much more tenuous than hydrocarbons in their nuclei. For Earth to have collected the amount of petroleum it contains would have entailed its passage through literally millions of cometary tails, and that, too, is not readily believable. What, then, are we left with?

RAINS OF NAPHTHA

We have no eyewitness reports from these long gone geological epochs to see if, indeed, hydrocarbons had rained down on Earth. But, as it happens, we *do* have such reports from a much later time. Immanuel Velikovsky had gathered quite a few of these accounts,[2] but, unfortunately, he ended up misplacing most of them in time. Taken up as he was in trying to prove the historicity of the Israelite Exodus from Egypt, he utilized most of these occurrences in his attempt to explain the miraculous wonders associated with that event. It is however evident from the sources he himself quoted that most of the celestial incidents in question had taken place much earlier in time.

What do these sources state? Or, as Philo Judaeus, the Hellenistic Jewish philosopher from Alexandria, asks: "What does natural history tell us?"[3] In answering his own question, Philo goes on with:

> "Destructions of things on earth, destructions not of all at once but of a very large number, are attributed by it to two principal causes, the tremendous onslaughts of fire and water. These two visitations, we are told, descend in turns after very long cycles of years. When the agent is the conflagration, a stream of heaven-sent fire pours out from above and spreads over many places and overruns great regions of the inhabited earth."

Streams of "heaven-sent fire" would make for unusual precipitation. Such phenomena are unknown at present. What could have caused such rains? Velikovsky himself was of the

[1] See here R. Gallo, "Letters to the Editor," *The New York Times* (March 16, 1987).

[2] I. Velikovsky, *Worlds in Collision* (N. Y., 1950), pp. 53-58.

[3] Philo Judaeus, *On the Eternity of the World*, IX:146-147.

opinion that these fiery streams from heaven could have been caused by the carbon and hydrogen contained in cometary tails when Earth passed through one of them. Lacking oxygen, he wrote, these gases would not normally burn, but when coming in contact with Earth's oxygen they could be set on fire.[1]

> "If carbon and hydrogen gases, or vapor of a composition of these two elements, enter the atmosphere in huge masses, a part of them will burn, binding all the oxygen available at the moment; the rest will escape combustion, but in swift transition will become liquid. Falling on the ground, the substance, if liquid, would sink into the pores of the sand and into clefts between the rocks; falling on water, it would remain floating if the fire in the air is extinguished before new supplies of oxygen arrive from other regions."[2]

Velikovsky's cometary explanation aside, it is a process similar to the one described by him that best accounts for the falling of liquid hydrocarbons on Earth. In our own scenario, the hydrocarbons would have precipitated from the aging proto-Saturnian sun. And yet, one may ask, all this on the say-so of Philo who, very much like Velikovsky, was *inter alia* bent on proving the reliability of the Old Testament? Had he been our only source, we would have been wary of using his above statement as evidence of anything. But there have been others who have written of these fiery streams from heaven. After all, as Philo himself informs us, what he stated was based on what "we are told," that is on what the ancient sources he relied on had to say.

Take, for instance, the myth of Ba'al and Mot as contained in a Ras Shamra text. Without delving into the myth itself, which, again, refers to a much later time, we note that the god El, identified as the proto-Saturnian deity in our previous works,[3] was said to have had a vision in which he saw "the skies dripping oil."[4] Or consider the Gnostic tractate known as *The Apocalypse of Adam.* This text not only speaks of fire and sulfur falling upon those who displease God, but also a rain of asphalt.[5] Would such preposterous ideas have even entered the myth-tellers' heads had there not already been a belief in such abnormal rains? And if that had been the case, what would have such beliefs been based on? As Albert Schott found it recorded, the Babylonians were often in the habit of referring to "the rain of fire," an event that was quite "vivid in their memory."[6]

So, similarly, with the Voguls of Siberia, who continued to remember a time when "God sent a sea of fire upon the earth." But it was not an ordinary fire since they referred to it as

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[1] I. Velikovsky, *op. cit.*, p. 53.

[2] *Ibid.*, pp. 53-54.

[3] *God Star*, pp. 135, 141, 142, 223-227, 229, 267-268, 283, 305, 433, 443, 448; *Flare Star*, pp. 118, 120, 122, 129, 132, 136, 280, 299, 347.

[4] A. Caquot, "Western Semitic Lands: The Idea of the Supreme God," *Larousse World Mythology* (London, 1972), p. 90.

[5] W. Barnstone (Ed.), *The Other Bible* (N. Y., 1984), p. 83.

[6] A. Schott, "Die Vergleiche in den Akkadischen Königsinschriften," *Mitt. d. Vorderasiat. Ges.*, XXX (1925), pp. 89, 106, as quoted by I. Velikovsky, *op. cit.*, p. 55.

"the fire water" which continued to rage, burning up the earth, for "seven winters and summers."[1] "Fire water," or "water of fire," here rendered *sengle das*, was also remembered by the aboriginal tribes of the East Indies. And there, too, was this "water of fire" said to have precipitated from the sky.[2] How else could primitive people describe a rain of burning oil other than as "fire water" or "water of fire"?

Descriptions of rains of fire from out of heaven are also encountered in the literature of Mesoamerica. These are usually attributed to a "Fire Sun" or "Sun of Fire"[3] which brings the flaring proto-Saturnian sun to mind.

It however seems that the precipitating hydrocarbons were not always set aflame. On occasion they merely fell in a viscous torrent. "It was ruin and destruction," states the sacred book of the Maya, "the sea was piled up...it was a great inundation...people were drowned in a sticky substance raining from the sky." Sometimes translated "resin,"[4] by others "glue,"[5] most authorities have proclaimed that the viscous torrent was actually bitumen. "There descended from the sky a rain of bitumen and of a sticky substance."[6] But even then it seems that a part of this substance *did* burst into flames since the same tract continues with: "And then there was a great din of fire above their heads."[7] A similar account is to be found in the *Annals of Cuauhtitlan* in which the flaming precipitation from the sky is attributed to "the sun of fire-rain."[8]

What is of additional significance is that the catastrophe, of which the sticky rain was but one aspect, was seen by the survivors as a punishment for not paying enough attention to the Heart of Heaven.[9] Also known as Hurakan,"[10] comparative mythology has already allowed us to associate this demiurge with the Saturnian deities of other nations.[11]

Although these accounts refer to a later event—though not as late as Velikovsky would have it—the probability is that similar rains would have precipitated from proto-Saturn during its flare-up at the end of the Pleistocene. We notice, for instance, that the account from the *Popul Vuh* also mentions that "the sea was piled up" and that this amounted to "a great inundation." As we have seen in our previous volume, similar incursions of the sea, due to Earth's rotational braking, also accompanied proto-Saturn's flare-up. [12]

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[1] U. Holmberg, *Finno-Ugric and Siberian Mythology* in *Mythology of All Races*, Vol. 4, pp. 368, 369.

[2] *Ibid.*, p. 369.

[3] H. B. Alexander, *Latin American Mythology* (1920), p. 91.

[4] D. Tedlock, *Popul Vuh* (N. Y., 1985), p. 84.

[5] M. S. Edmonson, *The Book of Council: The Popul Vuh of the Quiché Maya of Guatemala* (New Orleans, 1971), p. 26.

[6] C. E. B. de Bourbourg, *Histoire des Nations Civilisées du Mexique*, I, 55, as quoted by I. Velikovsky, op. cit., p. 54.

[7] *Idem* (Ed.), *Popul-Vuh* (1861), p. 25.

[8] E. Seler, *Gesammelte Abhandlungen zur Amerikanischen Sprach- und Alter-tumsgeschichte* (1902-1923), p. 798, as quoted by I. Velikovsky, loc. cit.

[9] *Popul Vuh*, 1:3-4.

[10] *Ibid.*

[11] *God Star*, pp. 438-439; *Flare Star*, pp. 156, 307.

[12] *Flare Star*, pp. 372 ff.

Of additional interest here is the realization by a class of geologists that oil was formed in association with sea level changes.[1] The probability is lent additional credibility by the discovery of aromatic and aliphatic hydrocarbons in sediments from Texas and Louisiana which have been dated to the Holocene (or Recent) epoch which followed immediately after the Pleistocene.[2] Moreover, as noted by Derek Scott Allan and J. Bernard Delair, the asphalt lakes of Trinidad, Venezuela, and California are impregnated by the remains of late Pleistocene animals and plants.[3]

THE RANCHO LA BREA TAR SANDS

The tar sands of the above sub-title, which have already been mentioned in passing, serve as a test case. These so-called tar "pits" were originally discovered at Rancho La Brea on the western outskirts of Los Angeles. The growth of the city eventually embraced the area which has been fenced in, but still available to public viewing, at Wilshire Boulevard in the very heart of the downtown district. Consisting of asphalt mixed with sand, this bituminous deposit is an outcrop of a larger bed of petroleum-containing shale that extends more than 450 miles from Cape Mendocino to beyond Los Angeles. In places, this bed reaches a depth of two thousand feet. By 1875, thousands of tons of asphalt had already been removed to be shipped to San Francisco for use as roofing and road paving material.

This bituminous formation was early found to contain an abundance of bones belonging to both extinct and extant animals. The extinct animals, with which we are mainly concerned, belonged to the Pleistocene epoch.

Among the faunal remains so far discovered in these beds are those of various insects, rodents, coyotes, lynxes, pumas, saber-toothed tigers, wolves, bison, camels, horses, sloths, mastodons, mammoths, various birds including vultures and peacocks, to say nothing of human bones. Some 200 different species have so far been recognized. By 1931, 700 skulls belonging to saber-toothed tigers alone had been recovered. In time, this rose to 2,100.[4] When it comes to wolves, 1,600 individuals have been retrieved. It thus seems that predators predominated. All of these remains were found in a close-packed conglomeration. Similar remains in asphalt from California have also come to light at Carpinteria, McKittrick, and San Pedro, as also in Peru and Russia.

The general theory behind the existence of this vast faunal assemblage is that the sticky tar would have deceived animals by the shallow sheets of water that would have accumulated on top of it through rainfalls. When animals were drawn to the water to slake their thirst, they would have become mired and trapped in the gluey asphalt from which they could not easily extricate themselves. Their cries would then have drawn others to the scene and, wading in to what appeared to be an easy prey, would themselves have gotten stuck in the bituminous un-

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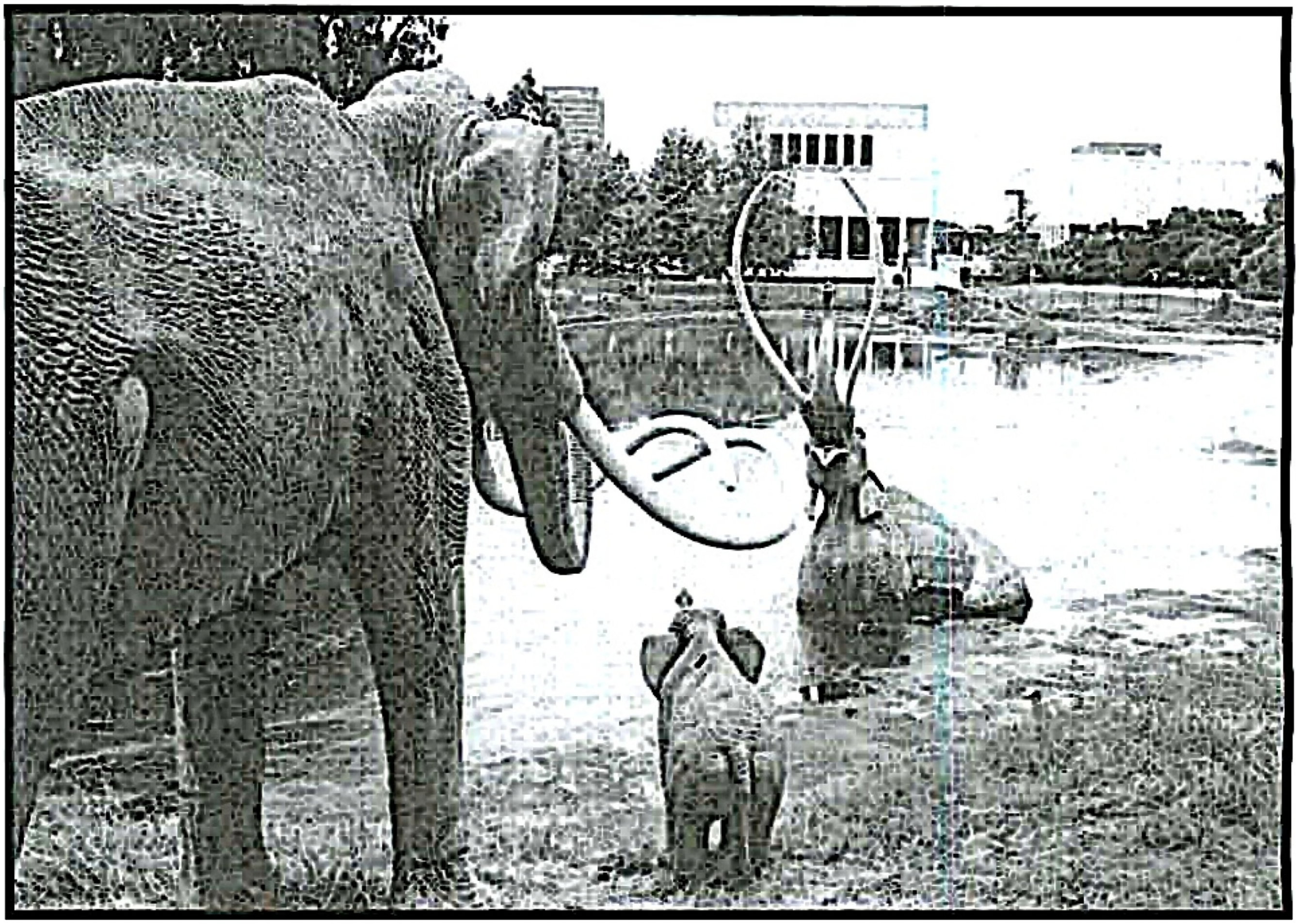
[1] *New Scientist* (May 4, 1996), p. 14.

[2] P. V. Smith, "The Occurrence of Hydrocarbons in Recent Sediments from the Gulf of Mexico," *Science* 116 (1952), pp. 437-439.

[3] D. S. Allan & J. B. Delair, *Cataclysm!* (Sante Fe, New Mexico, 1997), p. 203.

[4] C. Stock, *Rancho La Brea: A Record of Pleistocene Life in California* (Los Angeles, 1992), p. 32.



Reconstructed scene at the Rancho La Brea tar sands.
But did it really happen this way?
(Photograph by the author.)

derlay. One after the other, they all finally sank into the tarry depths. But, as J. Merriam noted as early as 1911:

> "As the greater number of the animals in the Rancho La Brea beds have been entrapped in the tar, it is to be presumed that in a large percentage of cases the major portion of the skeleton has been preserved. Contrary to expectations, connected skeletons are not common."[1]

McReady Price had also reported that the bones in question are "broken, mashed, contorted, and mixed in a most heterogeneous mass, such as could never have resulted from the chance trapping and burial of a few stragglers."[2]

All this led Velikovsky to ask whether it could have happened that "at this particular spot large herds of wild beasts, mostly carnivorous, were overwhelmed by falling gravel, tempests,

[1] J. C. Merriam, "The Fauna of Rancho La Brea," *Memoirs of the University of California* 1:2 (1911), as quoted by I. Velikovsky, *Earth in Upheaval* (N. Y., 1955), p. 66.

[2] G. McCready Price, *The New Geology* (1923), p. 579.

tides, and raining bitumen?"[1] However, William Akersten, who was the Curator at Rancho La Brea in 1982, tells us that McCready Price's report was not all that accurate. Thus, while the bones in question *are* scrambled, so wrote Akersten, they are not broken, mashed, and contorted as Price had had it reported.[2] But while this remains somewhat controversial,[3] Akersten is right in his claim that the very number of the trapped victims speaks against a catastrophic entrapment of live animals.

> "The concentration of remains also argues against catastrophe. The remains of more than 5,000 large carnivores have been recovered. Such a concentration would be inconceivable if only a short time interval were represented. The present population estimates of all large carnivores in the 25,000 square kilometer Serengeti region of Africa [which is much vaster than that covered by the California tar sand] is only 7,000."[4]

In all of this, Akersten relies heavily on the radiocarbon dates derived for these animals which are said to range between 38,000 to 11,000 years old.[5] His argument here is that, obviously, with such wide-ranging dates, the remains could not represent the victims of a single calamity. And then, even if one was to contend that, because of their very nature, these radiocarbon dates should not be relied upon,[6] it remains inconceivable that so many animals would have succumbed to raining bitumen in so relatively small an area as is covered by the La Brea deposit. Thus, at least to Akersten, the entrapment of these animals, a few at a time over a lengthy period, seems much "more probable."[7]

> "Since 90% of the large mammals at La Brea are carnivores, they were obviously attracted to the area. The most reasonable explanation right now is that previously trapped animals served as bait."[8]

Here one should keep in mind that, even at present, the tar sands continue to snare whatever life still inhabits Los Angeles' downtown area, such as birds, bats, and squirrels.

And yet there is more than one snag to all this. Let us leave land animals aside for a while and focus on the remains of birds instead. Under the orthodox scheme propounded above, one would expect that aquatic birds, being naturally attracted to lakes, would have been deceived in greater number than other types of birds in falling prey to the water-covered asphaltic traps.

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[1] I. Velikovsky, *loc. cit.*

[2] W. A. Akersten to J. D. H. Iles, private communiqué (May 3, 1982), published in the *Canadian Society for Interdisciplinary Study Newsletter* 1:3 (June 1982), p. 26.

[3] See here, for instance, *Science Frontiers* (November-December 2002), p. 3.

[4] W. A. Akersten, *loc. cit.*

[5] *Ibid.*

[6] See here *Flare Star*, pp. 17, 18, 24, 47, 49, 52, 176, 340, 351, 361, 387, 401, 404, 407, 451, 487, 512-513.

[7] W. A. Akerston, *loc. cit.*

[8] *Ibid.*

Yet the contrary is quite apparently true. The preponderance of the remains of land birds far outstrips that of aquatic ones.[1]

Fair enough, I'll play my own devil's advocate here. Aquatic birds would have floated on the surface of the water above the tar, had there been any. So that unless they waded in to shore where the tar might have stretched beyond the water's edge, they might have escaped being trapped. But what about human remains. The La Brea Woman has been dated at 9,000 years.[2] Wooden artifacts from the same area are said to be anywhere from 4,000 to 6,000 years old.[3] Others have vouched for 15,500 year-old artifacts.[4] But, again, let us leave these dates aside for the time being. The question is: How did humans and their trappings get mixed up with all the wild animals that were supposedly snared by the sticky substance? I'll give that humans could just as easily have trapped themselves in the seeping tar. But why would so many of their wooden artifacts have also been entombed in the stuff? More than that, the tar pools have also given up a far amount of plants which, through comparison, are known to have thrived during the time of the entombed animals.[5] Plants do not grow in tar pools, so how did this flora succumb to the bituminous sand?

More shocking is the fact that McCready Price was not the only one guilty of exaggeration. It seems, after all, that the remains of the extinct animals in question were not retrieved "from open, liquid asphalt lakes" but from "hard, asphalt impregnated sand or clay."[6]

> "Where encountered, asphalt was confined to small unfossiliferous pockets within the tar soaked sediment. The fossil remains were frequently admixed with gravel lenses, cobbles, and pebble clasts of fluviatile origin."[7]

This then gives an entirely different picture, one that was succinctly described by Vine Deloria, Jr., a picture that was not that much different from Velikovsky's original surmise:

> "Instead of the popular scenario, then, what more likely happened is that a very large mass of bones and vegetal material, the result, perhaps, of a natural catastrophe, was covered with sand and clay and some time later, probably a very short time later, some kind of asphaltic or bituminous material in vast amounts was dumped on this location. The asphalt tar then seeped into the sand and clay and in depressions made small pools which hardened into asphalt deposits with the passage of time."[8]

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[1] *Science Frontiers* (November-December 2002), p. 3.
[2] W. A. Akersten, *loc. cit.*
[3] *Ibid.*
[4] D. B. Vitaliano, *op. cit.*, p. 29.
[5] W. Chorlton, *Ice Ages* (Alexandria, Virginia, 1983), p. 61.
[6] G. Woodward & L. Marcus, "Rancho La Brea Fossil Deposits: A Re-evaluation from Stratigraphic and Geological Evidence," *Journal of Paleontology* 47:1 (January 1973), p. 56.
[7] *Ibid.*
[8] V. Deloria, Jr., *Red Earth, White Lies* (N. Y., 1995), p. 139.

There have been many who have been misled by the designation of the Rancho La Brea deposit as "tar pits," thus giving the impression of deep pits filled with gooey tar. In fact, however, *the pits in question were those dug by the excavators themselves.*[1]

So what, then, is the real answer? Were Velikovsky and Deloria correct after all? In the main it seems they were. Let us look at the evidence as it really exists.

That the beasts in question could not have died on the spot is evidenced by the fact that their bones are not articulated. There is no reason for all those bones to have been scattered all over the place even if some of them had suffered at the fangs and talons of predators. Besides, tar is a very good preservative and any animals immersed in it should have retained a semblance of skin and tissue. None have been retrieved.[2]

The immense quantity of gravel, cobble stones, and pebbles, all of fluvial origin, to say nothing of the sand itself, in which the bones are actually found preserved, speaks highly of an aqueous deposit. This seems to indicate that the bones were transported to the spot and deposited there by an immense wave. Such a wave would have been engendered through the temporary braking of Earth's rotation at the end of the Pleistocene Ice Age. [3] Due to Earth's rotation from west to east, the Pacific Ocean would have continued to move in that direction through inertia. This accords well with a tidal wave that would have swept the western coast of California. This also accords well with the late Pleistocene dating of the tar-entombed remains. Whether it was the wave itself that slew the animals or whether the wave picked up the skeletons of those already dead through some other means remains a moot question.

The far-spaced radiocarbon dates of the remains need pose no problem. If, as has been claimed, supernovae can alter planetary carbon at light-years' distance,[4] the lesser eruptive, but much nearer, proto-Saturnian flare-up[5] would surely have wrought havoc with Earth's atmospheric carbon content.

In the end the question centers on whether the tar itself seeped from below or fell from above. The generally held assumption, needless to say, is that the tar pools were formed 35,000 years ago by oil rising to the surface through sedimentary deposits from the Santa Monica mountains.[6] But, in 1973, a re-evaluation of the situation came to a different conclusion. Studies conducted on excavated tar pits 2050 and 2053 indicated that neither of them "would have been sufficiently stable to persist as continuously operative, open asphaltic pools during the long interval of alluviation accompanying the development of the Santa Monica plain."[7] That being the case, cosmic precipitation does not seem to be out of the question.

But what of those asphalt and oil deposits which are definitely much older? If, toward the end of the Pleistocene, oil and naphtha poured from the sky due to proto-Saturn's flare-up,

[1] G. Woodward & L. Marcus, *loc. cit.*

[2] *Science Frontiers* (November-December 2002), p. 3.

[3] *Flare Star*, pp. 372 ff.

[4] *Ibid.*, p. 340, where various sources are cited.

[5] *Ibid.*, pp. 290 ff.

[6] J. Hillaby, *New Scientist* (December 10, 1981), p. 762.

[7] G. Woodard & L. Marcus, *loc. cit.*

would we not require similar flare-ups to account for similar previous falls? Could proto-Saturn have flared up time and again?

That Saturn had flared up more than once had been suggested, if only in passing, by Harold Tresman and Bernard Newgrosh back in 1977;[1] it was proposed again by Hugh Eggleton, although in a garbled manner, in 1981;[2] and I myself touched upon the subject, although in no great detail, in 1982.[3] Tresman, Newgrosh, and Eggleton were concerned with two Saturnian outbursts that took place during the age of man. But, as I stated then, if ancient man remembers more than one Saturnian catastrophe, "there is a possibility that further Saturnian disasters had occurred *prior to the advent of humankind itself*."[4]

Proto-Saturn's Pleistocene flare-up was induced by its entry into the different electrical environment of the Solar System. But, despite a possible short-lived rebound, it did so only once. What, then, could have caused previous proto-Saturnian flare-ups?

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[1] H. Tresman & B. Newgrosh (writing under the name B. O'Gheoghan), "The Primordial Light?" *S.I.S. Review* II:2 (December 1977), p. 37.

[2] H. Eggleton, "Did Saturn Explode Twice?" *SIS Workshop* 4:3 (1981), pp. 15-17.

[3] D. Cardona, "Saturn's Flare-Ups," *SIS Workshop* 5:1 (1982), pp. 8-9.

[4] *Ibid.*, p. 9.

Chapter 4

Stellar Flares

THE ANTICS OF SN1987A

One of the most studied supernovae is the one which flared up in 1987. (Actually, when considering the star's calculated distance and the time its light would have taken to reach Earth, the flare-up is presently believed to have occurred some 170,000 years before.[1]) The flared star in question is known as Sanduleak[2] and is located in the Tarantula Nebula of the Large Magellanic Cloud. The supernova's remnant is now known as SN1987A. As with other supernovae, Sanduleak was believed to have exhaled a cloud of gas even before the explosion.[3] The neutrinos it was supposed to emit were detected. And the just as expected radio emissions it was meant to generate were also picked up by Earth-based instruments. Twin light echoes, "as the flash of radiation from the dying star passed through two sheets of dust," were even photographed.[4]

Right from the start, however, SN1987A perplexed the experts with a mixed bag of enigmas. Designated as a Type II supernova, SN1987A "should have grown in brightness during the next week or so, until it blazed as one of the brightest objects in the southern sky." Instead "it reached only one-tenth its expected brightness, then cooled rapidly from hot blue to a deep ruby color in just a few days."[5] This was then explained by positing that much of its energy had been spent by the motion of its expanding gas, so that less of it turned into light.[6] But then astrophysicists began to doubt that Sanduleak had been a blue star, suggesting instead that it had been a red supergiant before it flared up.[7]

One more puzzle concerned the appearance of a "mystery spot near the dying star" which baffled observers. Lying about two light-weeks away from SN1987A, it was surmised that it "could not have existed earlier."[8]

> "Although several creative theories were offered to explain the enigma, none proved conclusive. And by June [having been first observed in April] the companion no longer could be detected, leaving only questions behind."[9]

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[1] R. P. Kirshner, "Supernova: Death of a Star," *National Geographic* (May 1988), pp. 629, 635.

[2] In full: Sanduleak-69°202.

[3] R. P. Kirshner, *op. cit.*, p. 640.

[4] B. Weintraub, "A Super(nova) Mystery: Where's the Pulsar," *National Geographic* (August 1992), "Geographica" section.

[5] R. P. Kirshner, *op. cit.*, p. 629.

[6] *Ibid.*, p. 640.

[7] *Ibid.*, p. 646.

[8] *Ibid.*, pp. 630-631, 645-646.

[9] *Ibid.*, p. 632.

There were other mystifying surprises. Three delicate rings appeared in close association with the exploded star which astrophysicists are at a loss to explain within the confines of their theories. They nevertheless tell us that one of these rings, which actually circles the star, may have been created 30,000 years before the star flared up. The other two appear on either side of the star—or more likely beyond each pole—like mirror images of each other, while moving away from the primary which undoubtedly gave them birth.[1]

As reported by Robert Kirshner, however, the big surprise consisted of what did *not* transpire. Pulsars, which are claimed to be neutron stars that emit regular pulses, are believed to be created when a star's core collapses and gives rise to a supernova. But the pulsar that should have been birthed by SN1987A failed to make an appearance.[2] It was finally reported to have shown up in February of 1989, but this was not quite true. What showed up was what was called it's "subtle signal" which had to be "teased" out of the visual noise of the glowing clouds with the help of a super-computer. But then the hypothesized star's optical pulses implied such a rapid rotational period that, according to theory, it should have flown apart.[3]

Even so, to parrot Charles Hoy Fort, there was no agreement among the wise men. In fact, a team of astrophysicists from Columbia University challenged the claim that the detected pulses were really coming from a pulsating neutron star. According to this team, the pulses were actually coming "from a star vibrating like a struck bell in the aftermath of a supernova explosion." It was then claimed by the same team that the vibrating star may still "become a pulsar in a few years."[4] In other words it was a pulsar-in-the-making.

One other suggestion was that the pulses might be coming from a "strange star" composed of "strange matter," which "strange matter" had actually been invented by—shall we say a "strange theorist"?[5] But then, by 1998, it was enigmatically announced that new observations deny the very existence of super massive stars,[6] which meant that the progenitor of SN1987A could not have been such a theorized object.

Cassiopeia A, the remnant of an older supernova which had been observed in 1680, also supplied astronomers with something new. Having once believed that the shell of gas spawned by supernovae expanded smoothly outward at high speed, new enhanced pictures of Cassiopeia A showed anything but smoothness. Instead "dense blobs of gases, each as massive as 300 Earths" appeared distinctly in its expanding outflow.[7] As usual with such surprises, this led to a new theory. According to Robert Braun:

> "...an exploding star throws only a fraction of its mass into a smoothly expanding shell. The rest remains behind as slower moving fragments. When the shell slows

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[1] *Scientific American* (September 1994), p. 8; *ibid.* (January 1995), pp. 56-61; *Science Frontiers* (September-October 1994), p. 1.

[2] R. P. Kirshner, *op. cit.*, p. 644; B. Weintraub, *loc. cit.*

[3] S. Flamsteed, "Birth of a Pulsar," *Discover* (May 1989), p. 26.

[4] Columbia University press release as reported in, "False Alarm?" *Science Digest* (September 1989), pp. 48-49.

[5] *New Scientist* (September 2, 1989), p. 31; *ibid.* (September 9, 1989), p. 41.

[6] *Journal of the British Astronomical Association* (May, 1998), p. 223.

[7] S. Begley, "A Cosmic Birth Announcement," *Newsweek* (January 19, 1987), p. 55.

down, these fragments catch up and burst through."[1]

The "blobs" would then presumably be formed through the collision, or interaction, of the "slower moving fragments" as they plow through the "smoothly expanding shell." This, however, would contradict the claim that SN1987A's energy went mostly into the speed of its expanding gas shell rather than into light. Worse still, as Sharon Begley found reason to state: "Now theorists will have to explain how a star can explode in stages."[2]

Novae, as opposed to supernovae, are believed to be caused by dense white dwarf stars that have exhausted their hydrogen fuel. These white dwarfs, however, can only erupt, or so it is believed, when they siphon enough hydrogen off a companion star, usually a red dwarf, to trigger a runaway thermonuclear explosion.[3] Novae can be recurrent ones and one of these, which seems to flare up every twenty years or so, is T. Pyxidis in the dim southern constellation Pyxis. Somewhat like SN1987A, this particular recurring nova has also developed a bevy of rings, in this case all concentric ones.[4] It thus seems that rings, which we now know to be common among the gas giant planets of the Solar System, also go hand in glove with stellar flare-ups.

With so many surprises, so many mysteries unexplained, and so many *ad hoc* theories to explain others, one wonders if it is really known for certain what it is that causes stars to flare up. This was made clear when, in the late 1980s, computer models of supernovae, which took into account the nuclear physics supposedly involved in their outbursts, to say nothing of general relativity and hydrodynamics, simply failed to explode.[5] As the compilers of the "Monitor" section for the *Chronology & Catastrophism Workshop* asked: "Could there be some secret ingredient missing from the programs—such as electricity?"[6]

ELECTRIC DISCHARGES

That electricity plays an important—even the prominent—role in stellar outbursts had actually been postulated long before. As Alfred de Grazia, basing his belief on the works of C. E. R. Bruce and Eric Crew, straightforwardly stated: "A nova...is largely an electric phenomenon."[7] Evidence of this is indicated by the broadening of spectral lines detected from these outbursts. For those who are technically inclined, these spectral lines follow "the lambda square law of the Zeeman (magnetic) effect and not the lambda law of the Doppler effect."[8]

As de Grazia additionally emphasized: "In all the 'amazing' observations that we make about the 'world,' surely the continuous series of electrical relations that extend from the uni-

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[1] *Ibid.*

[2] *Ibid.*

[3] R. Gore, "The Once and Future Universe," *National Geographic* (June 1983), p. 730.

[4] "Blobs in Space: The Legacy of a Nova," Space Telescope Science Office of Public Outreach, press release #STScI-PR97-29.

[5] *Scientific American* (July 1988, p. 12.

[6] "Model Supernovas Won't Explode," *Chronology & Catastrophism Workshop* (1988:2), p. 22.

[7] A. de Grazia, *Chaos and Creation* (Princeton, 1981), p. 18.

[8] W. Thornhill, "Formation of Chondritic Meteorites and the Solar System," *Chronology and Catastrophism Review* X (1988), p. 53.

verse, through the galaxy and the sun and planets and space, through the atmosphere, through the rocks, throughout our bodies down to the extreme interior of every cell, must be among the most astonishing."[1] And as Eric Crew had stated even earlier: "One of the most striking and yet most neglected aspects of electricity in astronomy is the enormous forces which can be produced by an accumulation of electron charges."[2]

Actually, the importance of electricity and magnetism in space were already being discussed during the late 19th and early 20th centuries.[3] Investigations of these subjects received a boost in the early1900s by that forgotten Norwegian genius, Kristian Birkeland.[4] By 1937, that other maverick, but better known Swedish scientist, Hannes Alfvén, continued to press for the existence of a galactic magnetic field, that is one pervading the entire Galaxy. Today, as Anthony Peratt tell us, this "forms the basis...for one of the fastest growing areas of research in astrophysics."[5]

> "In 1950, together with his colleague N. Herlofson, Alfvén was the first to identify nonthermal radiation from astronomical sources as synchrotron radiation, which is produced by fast-moving electrons in the presence of magnetic fields. The recognition that the synchrotron mechanism of radiation is important in celestial objects has been one of the most fruitful developments in astrophysics, as nearly all the radiation recorded by radio telescopes derive from this mechanism...Disputed for 30 years, many [other] of his theories about the solar system have only recently [that is by 1988] been vindicated through measurements of cometary and planetary magnetospheres by artificial satellites and space probes."[6]

Guided by these giants, Bruce and Crew were able to apply their theories to account for the stellar outbursts with which we are concerned. As Wallace Thornhill more recently noted:

> "One of the basic premises of The Electric Universe was that the work of the late Dr. C. E. R. Bruce of the UK Electrical Research Association, and his disciple Eric Crew, is correct and that a nova explosion is a stellar or planet-wide electric discharge resulting in the expulsion of matter from the parent body in a 'blob,' or series of blobs."[7]

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[1] A. de Grazia, *op. cit.*, p. 19.

[2] E. Crew, "Electricity in Astronomy," Part 4, *S.I.S. Review* II:1 (Autumn 1977), p. 24.

[3] Z. Allen, *Solar Light and Heat* (1879); G. W. Warder, *The Universe: A Vast Electric Organism* (N. Y., 1904): G. Adam, *Concepts of the Electric Phenomena of Planetary Systems* (San Francisco, 1905); *idem*, *The Solar System* (1911); see also, W. Thornhill, *Electric Universe Presentation* (Amsterdam, 2005), Slide 52; W. Thornhill & D. Talbott, "The Need for a New Cosmology," *AEON* VII:1 (September 2006), p. 24; W. Thornhill & D. Talbott, *The Electric Universe* (Portland, Oregon, 2007), p. 87

[4] L. Jago, *The Northern Lights* (N. Y., 2001), pp. 174-175.

[5] A. L. Peratt, "Hannes Alfvén: Dean of the Plasma Dissidents," *The World and I* (May 1988), p. 190.

[6] *Ibid.*

[7] W. Thornhill, "About those 'Blobs in Space'," *THOTH* (electronic newsletter sponsored by KRONIA Communications), I:24 (October 20, 1997), p. 7.

Compare this to the above noted "dense blobs of gases" spewed out by Cassiopeia A as reported in the 1980s. Nor is the case of Cassiopeia A unique. The same set of events has also since been reported in connection with the recurrent nova T Pyxidis. The Hubble telescope managed to reveal "more than 2,000 [of these] gaseous blobs packed into an area that is one light-year across."[1]

> "Resembling shrapnel from a shotgun blast, the blobs may have been produced by the nova explosion, the subsequent expansion of gaseous debris, or collision between fast- and slow-moving gas from several eruptions...This new evidence suggests that astronomers may have to rewrite their theory of nova eruptions and accompanying debris."[2]

As Thornhill goes on:

> "[One notices] the number of special conditions required of the exploding star under conventional theory. None apply to the electric discharge model. All that is required is a build-up of charge between two bodies, *or a single body and its galactic environment*, until breakdown of the plasma occurs."[3]

Theoretically speaking, the above requirement for a star's flare-up is satisfied by the posited entry of the proto-Saturnian system into the different "galactic environment" of the Sun's domain of electric influence.[4] To de Grazia, who based his work on that of Ralph Juergens as much as he did on that of Bruce and Crew, the answer concerning proto-Saturn's *previous* disruptions appeared simple enough. Reminding us that a "complicated natural system of sheaths surrounds bodies in space," he further explains that this system "balances, and neutralizes charges to keep cosmic bodies in the state which we come to regard as 'normal'..."[5] But while it is now known that all bodies in space are held within such plasma sheaths, is it only when such bodies come within each other's different electric potential that electric discharges can take place?

CELLULAR PLASMA

By 1999 it was finally conceded that the space between the galaxies is not as dark and empty as once thought. This revelation came from Robert Kunzig in reference to the discovery made by Roberto Méndez and other astronomers. What Kunzig was alluding to was Méndez's disclosure that there are many lone stars "flying free in space, unbound to any galaxy, in regions that once looked black and empty."[6] That lone brown dwarf stars are also found

[1] "Blobs in Space: The Legacy of a Nova," Space Telescope Science Office of Public Outreach, Press Release #STScI-PR97-29.

[2] *Ibid.*

[3] W. Thornhill, *loc. cit.* (emphasis added).

[4] *God Star*, pp. 321 ff.; *Flare Star*, pp. 259 ff.

[5] A. de Grazia, *loc. cit.*

[6] R. Kunzig, "Lone Star in Virgo," *Discover* (February 1999), p. 82.

traveling alone through space in abundance has been known for quite a while.[1] But this unattended free wandering through space had not yet been found to apply just as well to regular stars (if there is even such a thing). Méndez himself had calculated that, in the Virgo cluster of galaxies alone, a third of all the stars may be loners. Rolf-Peter Kudritzki was even willing to push this fraction up to a half. According to him, "there are as many stars *outside galaxies* as inside."[2]

To be sure, and to give proper credit, the assumption that "some stars had an independent streak" was proffered by Fritz Zwicky in 1951, but this was based on a diffuse background of light that showed on Zwicky's photographic plates of the Coma cluster of stars. Zwicky was of the opinion that "the light might come from stars ripped out of galaxies," but most others believed that the diffuse light was more probably due to a photographic flaw.[3] But then computer simulations conducted in the 1970s "began to imply that extragalactic stars *had* to exist—though people still didn't give much thought to that implication."[4] It was not until 1997 that—thanks to the work done by Méndez, Kudritzki, Magda Arnaboldi, George Jacoby, and Robin Ciardullo—actual photographs of these lone traveling stars through space were obtained.[5] This discovery was then abetted by similar detections in "blank" patches between the Virgo clusters by Harry Ferguson and his colleagues, as also in the Fornax galaxy cluster by Tom Theuns and Stephen Warren, both from Britain. As Kunzig noted: "There could no longer be any doubt that intergalactic stars exist and are numerous."[6]

What I wish to note next is that the region through which these lone stars are traveling is not itself an empty space. On the contrary, many physicists now assume that the so-called vacuum of space "is a vast reservoir of energy rather than the quintessence of nothingness."[7] Although assumed by most to be filled with theorized, but undetected, dark matter,[8] Birkeland had much earlier theorized otherwise. "It seems to be a natural consequence of our point of view," he wrote in the early 1900s, "to assume that the whole of space is filled with electrons and flying ions of all kinds" and that it is "not unreasonable...to think that the greater part of the material masses in the universe is found not in the solar systems or nebulae, but in 'empty' space."[9]

Although Birkeland's views were severely criticized, modern discoveries were to vindicate him in full. To quote one modern authority:

> "Most of the visible matter in the universe exists as a fluid composed of electrically charged particles rather than as a gas made of neutral atoms or molecules. Gas mixtures of electrically charged particles, such as electrons and ions, are called *plasmas*.

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[1] *God Star*, pp. 335 ff.
[2] R. Kunzig, *loc. cit.* (emphasis added).
[3] *Ibid.*, p. 84.
[4] *Ibid.* (emphasis as given).
[5] *Ibid.*, pp. 85-86.
[6] *Ibid.* p. 86.
[7] T. Folger, "At the Speed of Light: What if Einstein was Wrong?" *Discover* (April 2003), pp. 39-40.
[8] *Ibid.*, p. 40.
[9] K. Birkeland, *The Norwegian Aurora Polaris Expedition: 1902-1903*, as quoted by L. Jago, *op. cit.*, p. 275.

Plasmas are found in the following solar system environments: the solar atmosphere, the interplanetary medium, planetary magnetospheres, and planetary ionospheres. *Most of the interstellar medium is also plasma, as are most other regions of our galaxy.*"[1]

Plasma itself, which is now known to constitute 99% of the Universe, "is a gas—or really a state of matter beyond that of gas, which consists of positively charged atoms (called ions) and the free electrons that have been stripped from them."[2] Moreover, electrified plasma has a tendency to organize itself into filamentary structures, which filaments are apparent from the nature of Earth's auroras to regions beyond.

"In 1984 [Brian Hills expands], large scale plasma vortex filaments were discovered on the galactic distance scale, at the centre of our Milky Way galaxy and were observed to extend for hundreds of light years across the galaxy. The electric currents within them were observed to run towards the galactic centre in the plane of the galaxy and then turn up the axis of rotation. This was the first evidence that plasma filaments may be involved in galactic evolution...in 1989 radioastronomers detected plasma filaments on the scale of clusters and super-clusters of galaxies. Enormous filaments were found to stretch between two galactic clusters through the apparent vacuum of intergalactic space. The current flowing through this inter-galactic cluster filament was estimated to be a staggering 5-10 million trillion amperes! It therefore appears that space is not an endless vacuum, punctuated by galaxies, but is filled with twisting and snaking plasma filaments ranging from the planetary sizes up to galaxy super-clusters distances. This picture of the universe has stimulated the development of a cosmology radically different from conventional big bang theory."[3]

But there is more. "From *in situ* observations," Alfvén informs us, "we know that there are current layers in space which separate space into regions with different magnetization, different temperatures and densities, and even different chemical compositions."[4] To which he added:

"Thus it has been found that space plasma has a tendency towards a cellular structure. This tendency has been observed throughout the regions at present accessible to spacecraft. As it is impossible to claim that such a basic property of a plasma (its tendency to produce cellular structures) should be confined to the regions presently available to spacecraft, one must conclude that space in general has a cellular structure...The different chemical compositions on both sides of the [Sun's] magnetopause may have a counterpart in interstellar and intergalactic space..."[5]

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[1] T. E. Cravens, *Physics of Solar System Plasmas* (Cambridge, 1997), p. 1 (second emphasis added).

[2] F. Schaaf, *Comets of the Century: From Halley to Hale-Bopp* (N. Y., 1997), p. 43.

[3] B. Hills, *Origins: Cosmology, Evolution & Creation* (Cambridge, 2003), p. 38.

[4] H. O. G. Alfvén, "Cosmology in the Plasma Universe: An Introductory Exposition," *IEEE Transactions on Plasma Science* 18:1 (February 1990), p. 6.

[5] *Ibid.*, pp. 6-7.

Alfvén also tells us that: "All known cosmic plasmas are magnetized..."[1] It thus follows that, with different regions of cellular plasmatic space containing different magnetization, the electric potential of each plasma cell must also differ. And it is this difference in electrical potential that Thornhill had in mind when he upheld the view that stellar flares are due to electric discharges. "All that is required," we have seen him state, "is a build-up of charge between two bodies, or a single body and its galactic environment, until breakdown of the plasma occurs."

The build-up of charge between two bodies would apply to novae, now known to be the flare-up of stars in binary partnership. The flare-ups in this case are presently believed to be the result of a white dwarf star stealing the gaseous matter from its less massive partner, wrapping it around itself, and thus gaining too much mass to self sustain. But in stealing mass the white dwarf would also be stealing a fair amount of the electric energy from the robbed star, which energy it would not eventually be able to hold. Although not yet accepted by mainstream astronomy, the result would be an electric discharge of colossal proportions. As long as the binaries remain together, the process can be repeated periodically, thus giving birth to *recurring* novae. Thornhill further claims that:

> "The biggest change in plasma properties would occur, in my opinion, at the boundary of a star's plasma sheath. So binary stars with elliptical orbits and stellar encounters are good candidates."[2]

That binary stars are electrically powered was actually proposed by astrophysicists in 2002.[3]

Supernovae of Type I have been theorized to be the final outcome of recurring novae, when the buildup of internal pressure becomes too great for the white dwarf to sustain. Might we not posit that it is the buildup of electric charge stolen from the partner that results in a mighty discharge?

When it comes to Type II supernovae, the process is believed to be somewhat different. In this case it is a giant star, rather than a white dwarf, that violently erupts. The outburst is believed to be the result of a runaway fusion of elements until the star runs out of fuel and collapses. But might it not be that these stars are simply ridding themselves of an excess electric charge dumped on them as they cross from one plasma cell into another of higher electric potential? "If the change in plasma properties are large," Thornhill believes, "then the star has to adjust quickly, which may result in expulsion of charged matter."[4] If, on the other hand, single stars travel into a cell of lesser potential, they would not discharge.

Is it then possible that proto-Saturn would have experienced a series of previous flare-ups due to its passage from one plasma cell into another of higher electric potential? Let us dig a little deeper before we answer that all-important question.

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[1] *Idem, Cosmic Plasma* (Dordrecht, 1981), p. 100.

[2] W. Thornhill to D. Cardona, private e-mail communiqué, January 13, 2005.

[3] K. Wu, *et al., Monthly Notices of the Royal Astronomical Society* 331:1 (March 2002), pp. 221-227.

[4] W. Thornhill, *loc. cit.*

MULTIPLE SUPERNOVAE

To begin with, Anthony Peratt does not subscribe to the above theory concerning novae and supernovae. True enough, as he had it stated: "I can envision that Saturn did indeed flare up," mainly due to the instabilities in plasmatic electrical current surges. These surges, according to him, "are periodic in space (and laboratory) plasmas."[1] He does not, however, believe that these current surges have anything to do with the passage of stars from one plasma cell into another, although he did add that "truly, [at present] no one really knows."[2] Besides, as he made clear to this author, galactic plasma cells "might be envisioned" to be larger entities than the scales with which we are presently involved.[3] A supernova "has all the earmarks of an intense plasma pinch, in radiation, temporal evolution, and morphology," he explained. "The same holds for novae, but less intense pinches."[4]

These pinches would be those of the plasmaspheres associated with the stellar bodies themselves. Moreover, galaxies are known to host multiple supernovae. These would not be the recurring outbursts of the same stars, but the recurring flare-ups of different stars within the same galaxy. In conducting a statistical in-depth study of this phenomenon,[5] E. Sanders has come to the conclusion that a large and consistent percent of galaxy hosts that exhibit multiple supernovae will give birth to one such flare within four years of a previous one. [6] As Sanders points out, "these trends do exist and are consistent over time, and becoming increasingly obvious with the improved systematic coverage of automated [supernova] surveying."[7]

> "In a plasma universe as espoused by Hannes Alfvén [Peratt told Sanders], periodicity of high-energy-density events in the universe is what one expects. The reason for this is that we view the universe as we view the solar system and laboratory plasmas as being filled with current-conducting filaments. As such, energy built up in one part of space, say by the relative motion of plasma clouds, can be released hundreds of megaparsecs away by the filamentary 'transmision lines.' This release is usually found, either in solar plasmas, auroras, or pulsars, to be periodic...Supernovae in the plasma community have been viewed as the release of energy from a galactic-dimensional filament with a very plasma-like behavior."[8]

"This," adds Sanders, "now appears to include periodicity: a predictable apparent timeliness between successive events." Thus, "a large-scale interconnectedness" across galactic

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[1] A. L. Peratt on the Intersect electronic discussion group sponsored by KRONIA Communications, September 29, 2004.

[2] *Idem* to D. Cardona, private e-mail communiqué, January 11, 2005.

[3] *Idem* to D. Cardona, private e-mail communiqué, January 23, 2005.

[4] See reference #59.

[5] E. Sanders, "Trends in Apparent Time Intervals Between Multiple Supernovae Occurrences," *IEEE Transactions on Plasma Science* 31:6 (December 2003), pp. 1252-1262.

[6] *Ibid.*, pp. 1259, 1260.

[7] *Ibid.*, p. 1261.

[8] *Ibid.* (ellipsis as given).

space "is implied which cannot be explained by current conventional thinking."[1] This is in keeping with Alfvén's original claim that space is filled with "a network of currents which transfer energy and momentum over large or very large distances."[2]

That galactic space is filled with filamentary plasmas is now an accepted tenet of astrophysics.[3] In fact, as W. Bostick could confidently announce in 1986, nature's preferred plasma structures *are* filaments and strings.[4] What seems to occur in multiple supernovae within any one galaxy is that the surge of current that can cause a star to flare up would then travel along one of these filaments to another star that would then pinch its plasmasphere causing it to erupt in turn. Such surges seem to take about four years for each passage.

But how would any of this apply to the proto-Saturnian brown dwarf star that forms the basis of this work?

THE EVOLVING NATURE OF BROWN DWARF STARS

Brown dwarf stars have now been found to be "produced in all possible masses between planets and stars."[5] By the end of 2004, Robert Naeye could additionally report that "there's no longer any doubt that these substellar objects exist throughout the galaxy in large numbers."[6] According to Gibor Basri, our own galaxy alone seems to contain as much as 100 billion brown dwarfs.[7] He is thus of the opinion that brown dwarfs are as common as stars.[8] And not only do brown dwarfs *look* like stars, they *behave* like stars as well. Very much like *bona fide* stars, brown dwarfs seem to be "surrounded by clouds of very hot and very cool gas." At least, through the use of the Hubble Space Telescope, researchers have discovered just such "a cloud or disk containing molecular hydrogen gas" surrounding the brown dwarf that goes by the designated number 1207. "Hydrogen molecules had previously been found around very young stars but never before in a brown dwarf." As usual astronomers were astonished, not to say perplexed, by this discovery. "It's really amazing," John Gizis from the University of Delaware declared, "that the gas around this tiny brown dwarf is behaving so much like the gas around much more massive newly forming stars..."[9]

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[1] *Ibid.*

[2] H. Alfvén, "Cosmology in the Plasma Universe: An Introductory Exposition," *IEEE Transactions on Plasma Science* (February 1990), . p. 5.

[3] See for example, H. Dahlgren, "Filamentary Structures in Planetary Nebulae," *Astrphys Space sci (2007) 310.*

[4] W. H. Bostick, "What Laboratory-Produced Plasma structures can Contribute to the Understanding of Cosmic Structures Both Large and Small," *IEEE Transactions on Plasma Science*, Vol. PS 14, No. 6 (December 1986), p. 711.

[5] G. Basri, "The Discovery of Brown Dwarfs," in "The Secret Lives of Stars," *Scientific American* (2004 special edition), p. 31.

[6] R. Naeye, "Binary Sheds Light on Brown Dwarf Formation," *Sky & Telescope* (October 2004), p. 22.

[7] G. Basri, *op. cit.*, p. 30.

[8] *Ibid.*, p. 33.

[9] "Astronomers Discover Cold, Warm and Hot Gas Around a Yong Brown Dwarf," Press Release by the Pennsylvania State University, January 10, 2005.

It had, of course, been known for some time that "brown dwarfs are often surrounded by [so-called] accretion [that is, circumstellar] disks like young stars."[1] On the basis of such detections, Subhanjoy Monhanty and his colleagues have come to the conclusion that "brown dwarfs form the same way stars do."[2]

The similarity does not end there. Spectral lines now provide evidence that brown dwarfs also emit "jets,"[3] the association of which with circumstellar disks has long been proposed.[4]

Although the majority of brown dwarfs trek alone through space, others seem to travel in pairs. Such a binary brown dwarf star has been discovered in the star-forming region designated Chamaeleon I.[5] In fact, according to Alan Boss:

> "Brown dwarf stars have been found to be commonplace, though seldom as companions to sunlike stars. The best place to find a brown dwarf is in orbit around another brown dwarf."[6]

This class of brown dwarfs can therefore be compared to stellar binaries. And, to be sure, the brown dwarf binary system mentioned above has added to the conviction that "brown dwarf stars have normal stellar births," that they "formed the same way as stars, in a relatively gentle and undisturbed manner."[7]

Together with all that has been established above, there is little reason to suppose that brown dwarf stars are not *bona fide* stars despite their lesser mass—which is what the likes of Wallace Thornhill had been claiming for years before.

"It is remarkable," stated Basri, "that these nearby and common objects, as abundant as stars, have only now begun to reveal their secrets."[8] In that respect, it is also revealing that a scientific journal carrying one of the items concerning the discovery of the binary dwarf discussed above is titled "Stellar runts *are* stars."[9]

If, then, brown dwarf stars are *really* stars, would we not expect them to behave in like manner? If binary stars are prone to birthing recurring novae, why not binary dwarfs? And if solitary stars can also flare up, why not brown dwarfs? If stars can discharge by passing from one plasma cell into another, why not brown dwarfs? Or if, as per Peratt, stars can electrically unload through pinches in their plasmaspheres, again why not brown dwarfs?

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[1] R. Naeye, *loc. cit.*

[2] *Idem*, "'Free-Floating Planet' Claims Bolstered," *Sky & Telescope* (October 2004), p. 20.

[3] *Ibid.*

[4] O. Blaes, "A Universe of Disks," *Scientific American* (October 2004), p. 52.

[5] R. Naeye, *loc. cit.*

[6] A. P. Boss, "Companions to Young Stars," in "The Secret Lives of Stars," *Scientific American* (2004 special edition), p. 25

[7] K. K. Whitt, "Stellar Runts *are* Stars," *Astronomy* (October 2004), p. 26.

[8] G. Basri, *op. cit.*, p. 33.

[9] K. K. Whitt, *loc. cit.* (emphasis as given).

We had, in our first volume of this series, described how life on Earth would have fared as a satellite of a brown dwarf star.[1] We had there relied on a model that had been proffered by Ken Croswell in 2001.[2] The major difference between Croswell's model and ours was the replacement of his planetary orbital path with our linear axial lock. This change was not only required by the mytho-historical record on the basis of which we had originally reconstructed our model, but also by Earth's geological scars and the evidence from paleontology and other disciplines.

Dwarf stars, however, embody a particular hazard which applies to Croswell's model as much as it does to ours. At times, as Croswell himself pointed out, dwarf stars tend to "brighten dramatically, spewing large flares that can more than double the star's brightness in a matter of minutes." And such flares, he went on, "might damage life, but they might also help it evolve, by increasing the mutation rate."[3]

Brown dwarf stars have now been sufficiently studied to show that they can, and do, emit strong X-rays[4] as well as radio waves during flare-ups of intense energy.[5] However, these brown dwarf outbursts were originally likened to solar flares rather than bona fide novae.[6] But with radio flares 10,000 times stronger than X-ray emissions would otherwise indicate from an object the mass of which is only 6 percent that of the solar orb[7]—with beams of radiation "thousands of times brighter than any released by the Sun"[8]—one begins to wonder. This is especially so since similar radiative energy is also emitted during novae and supernovae outbursts.[9] If solar storms can, as they do, wreak havoc on our world, one can just imagine the mayhem such super-flares from the much nearer sub-brown dwarf that was proto-Saturn would have caused on Earth.

Thornhill refers to these flares as stellar lightning flashes and is not therefore of the opinion that they are due to the dwarf's passage from one plasma cell into another. "Being in the nature of a lightning flash," he has written to this author, "it is more likely that there is some charging process inherent in many dwarf stars that is occasionally released by a sudden flare-up."[10] Thus, according to him, proto-Saturn's previous flare-ups "would seem to [have

[1] *God Star*, pp. 343 ff.

[2] See following reference.

[3] K. Croswell, "Red, Willing and Able," *New Scientist* (January 27, 2001), pp. 30-31.

[4] M. Weinstock, "Powerful Flare from Brown Dwarf Shocks Scientists," *Space.com* (July 12, 2000).

[5] R. R. Britt, "Brown Dwarf Emits Strong Radio Flare, Muddling Definitions," *Space.com* (March 14, 2001).

[6] *Ibid.*

[7] M. Weinstock, *loc. cit.*

[8] P. Rincon, "Dwarf Stars Emit Powerful Pulse," *BBC NEWS* (April 21, 2007); in full by G. Hallinan, *et al.*, "Rotational Modulation of the Radio Emission from the M9 Dwarf TVLM 513-46546: Broadband Coherent Emission at the Substellar Boundary?" *The Astrophysical Journal* (December 10, 2006), pp. 690 ff.

[9] *New Scientist* (November 10, 2001), p. 16.

[10] W. Thornhill to D. Cardona, private e-mail correspondence, January 17, 2005.

Solar flare, the likes of which cause havoc on Earth's weather and communication systems.
(Photograph courtesy of NASA.)

depended| on the variability of proto-Saturn as a star, before entering the Sun's sphere of electrical influence."[1]

Now it is quite true that the ultra-bright flashes from the brown dwarf designated TVLM 513-46546 seem to occur in a periodic cycle more or less every two hours.[2] Cyclical eruptions with such short durations between them can hardly be likened to a series of flare-ups occurring between the much longer periods down through Earth's geological eras. In this respect, the brown dwarf in question has been likened to a pulsar.[3] These pulsating stars, however, are believed to be created when stars erupt as supernovae.[4] Is it not then possible that any brown dwarf which emits such cyclical pulses had also undergone similar nova-like disruptions? As we have already noted in our previous volume,[5] it matters little whether pul-

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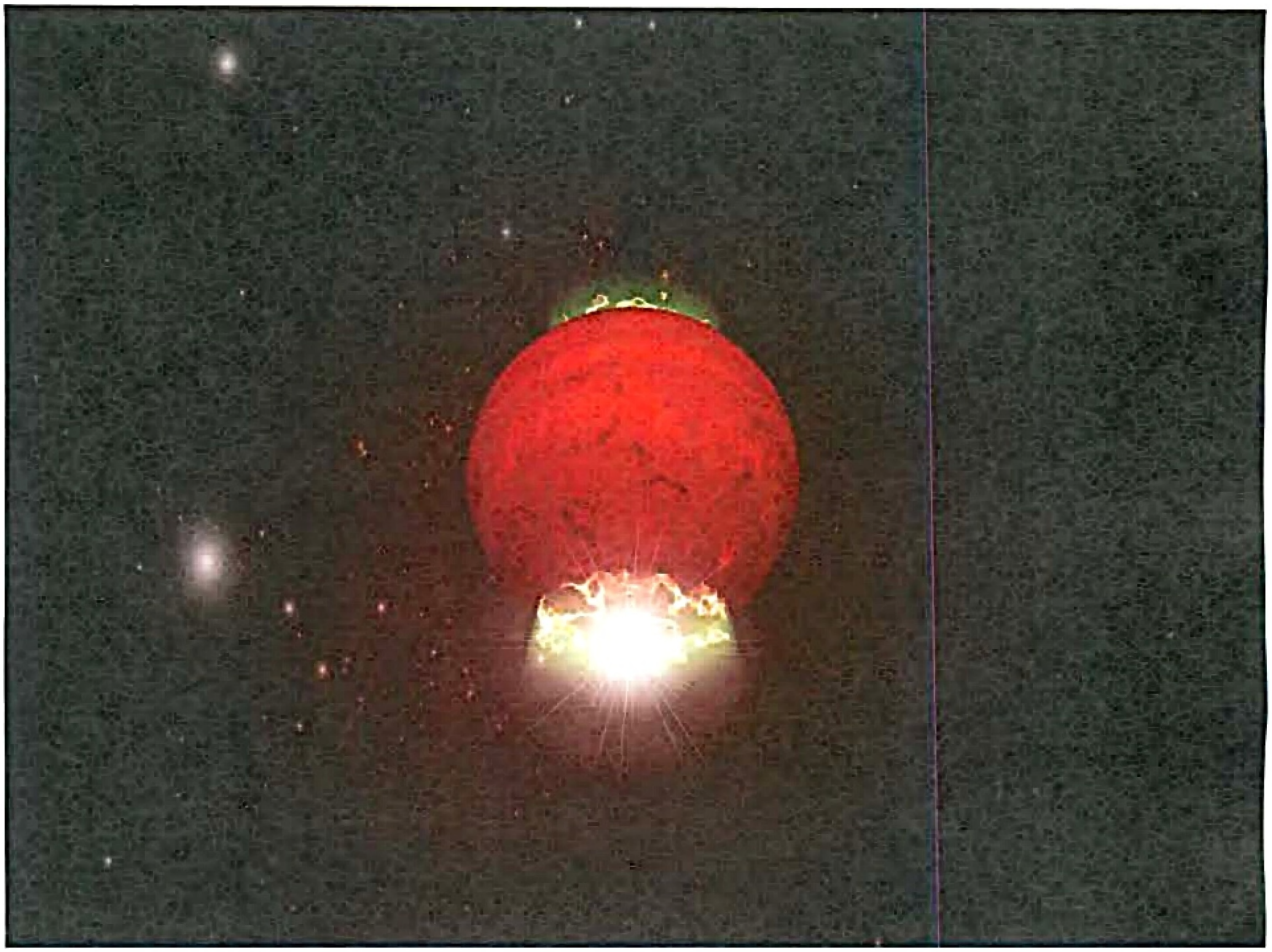
[1] *Idem* to D. Cardona, private e-mail correspondence, October 9, 2004.

[2] P. Rincon, *loc. cit.*

[3] *Ibid.*

[4] C. Kouveliotou, *et al.*, "Magnetars," *Scientific American*, Special edition—*The Secret Lives of Stars*—(2004), pp. 72-73; W. Gater, "Celestial Clocks Can't Keep Time," *Astronomy Now* (April 2006), p. 17.

[5] *Flare Star*, p. 501.



Flaring brown dwarf star.
(Illustration courtesy of Hallinan, *et al.*, NRAO/AUI/NSF.)

sars pulse in lighthouse fashion due to their theorized high rotational speed,[1] or whether they oscillate due to inherent electrical discharges.[2]

Add to this the detected circumstellar clouds and spectra-intimated "jets" associated with brown dwarfs, larger versions of which are also allied with supernovae, and the distinction claimed between the two narrows even further. Besides, if brown dwarfs are now believed to act like stars—if, in fact, they *are* stars—why should we be surprised to learn that they, too, can flare in nova-like brilliance and repeatedly so?

At bottom lie these contingencies: Supernovae remnants emit jets. As I aim to show in the next volume of this series, proto-Saturn, too, re-emitted its retracted jet following its flare-up.[3] Its previous jet, however, was indicative of an earlier disruption. Thus, the proto-Saturnian circumstellar disk we have also posited in association with the proto-Saturnian

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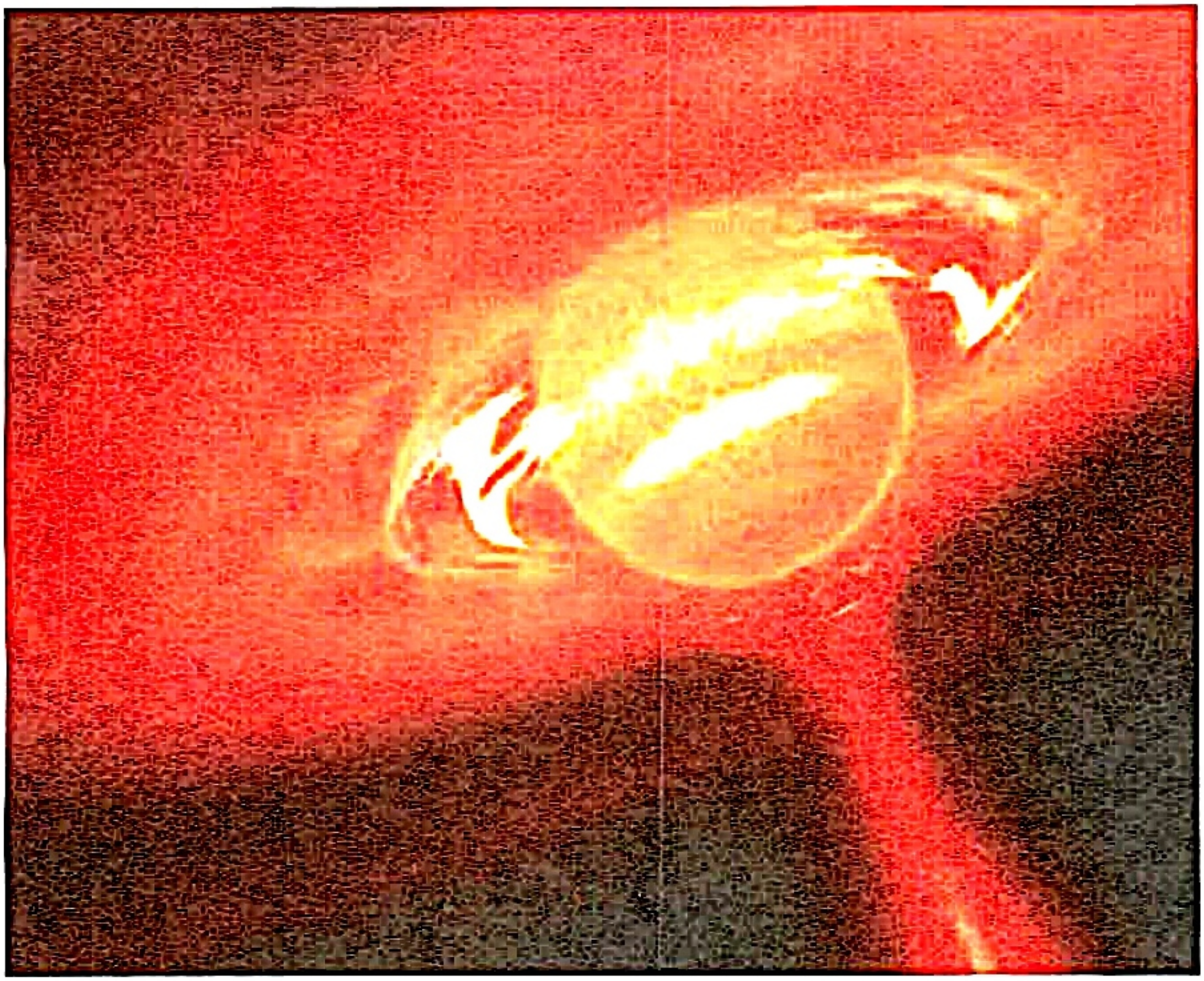
[1] K. Cooper, "The Stop-Start Pulsar," *Astronomy Now* (June 2006), p. 14.

[2] See here, for instance, D. E. Scott, *The Electric Sky* (Portland, Oregon, 2006), pp. 177-179.

[3] See *God Star*, pp. 429 ff. re proto-Saturn's jet, and *Flare Star* pp. 279 ff. re its retraction.



Artistic impression of a jetting brown dwarf.
(Illustration courtesy of ESO.)

sun[1] would also have been the remnant cloud from a former outburst. What this leads to is not only that proto-Saturn acted very much like a dwarf nova, but that it was a *recurring* one.

The Sun switches polarity. Brown dwarfs must also switch polarity, but, due to their lesser electrical charge, they would probably do it less frequently. Earth's reversed polarity might have been due to reversed polarity on proto-Saturn because it would have been axially coupled with proto-Saturn. The Sun's changing polarity does not reverse Earth's polarity because Earth is not axially coupled with the Sun.

It should have by now become apparent that brown dwarfs are as prone to outbursts as their more massive stellar cousins. Having been a sub-brown dwarf, proto-Saturn would not have acted differently. I shall leave it to future disclosures to ascertain whether proto-Saturn's previous flare-ups were due to its travel from one plasma cell into another; to plasma pinches; to the

[1] *God Star*, pp. 261 ff.; *Flare Star*, pp. 217 ff.

surging of current along plasma filaments; or to inherent charging followed by lightning flash releases.

One thing I should however stress is that the cataclysms suffered by Earth in earlier ages by far surpassed the damage sustained at the end of the Pleistocene. If, then, we aim to blame these earlier catastrophes on proto-Saturn's previous flare-ups, it becomes more than evident that these previous flare-ups were much more energetic than the one which occurred due to proto-Saturn's entry into the Sun's domain.

If, however, it is ever found that brown dwarf flares are intrinsic, it would have to be assumed that proto-Saturn's Pleistocene flare-up was induced through an electrical short-circuit once its plasmasphere came in contact with the Sun's heliosphere. If so, that particular flare-up would have to have occurred out of cyclical sequence, and that, too, might account for its less energetic outburst on that occasion.

PART TWO

REVOLUTIONS

Chapter 5

A Thumbnail History of Gigantism

THOSE TERRIBLE LIZARDS

Dinosaurs. Just about every child in the western world knows about them. We have been regaled with pictures of them since we were kids. The movie industry has brought them back to life on more than one occasion. We have been awed by their size, their ferocity, and the shaking of the ground beneath their feet. Museums and traveling exhibits have treated us to their fossilized collections and reconstructed skeletons, to say nothing of mechanical replicas in motion. But what do we really know about them? All that we have knowledge of is what we have been fed by those who have wanted us to believe that they know all about them. Most of what we have been fed, however, is really nothing more than the whimsical guesses of those who have been feeding us.

Take the distinguishing colors with which dinosaurs have been garnished. These lurid markings have always rendered them more realistic. But, in truth, these colors are nothing but the fanciful guesses of the artists who produced the illustrations that have been entertaining us since childhood. As William Weed disclosed: "Most dinosaur colorations in recent years—and every year brings a wider range of patterns and pigments—are based on guesses about the landscape the creature lived in and its need for camouflage."[1] Nor is color the only guesswork involved in the fleshing out of dinosaur skeletons.

> "The bones are evidence that's interpretable [Weed goes on]. The muscles are guided guesswork. Everything else—soft tissues, skin, folds, frills, cheeks, lips, eyes, nostrils, pattern, color, covering—is artistic license..."[2]

The above is exemplified by the elephant, the bones of which contain no clues to its distinctive trunk. Had elephants not survived the vagaries of nature, its fossilized bones would not have told us what the beasts really looked like. Given just an elephant skeleton, Weed informs us, it would probably have been rendered as nothing more than "a titanic hamster."[3]

"In the earliest paintings," Carl Zimmer wrote in 2005, "they writhe like beached sea serpents or slough like reptilian potbellied pigs." To which he added: "Now we know better."[4]

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[1] W. S. Weed, "What Did Dinosaurs Really Look Like...And Will We Ever Know?" *Discover* (September 2000), p. 78.

[2] *Ibid.*, p. 79.

[3] *Ibid.*, p. 76.

[4] C. Zimmer, "Dinosaurs," *Discover* (April 2005), p. 32.

Because the bones of dinosaurs are interpretable, just about everything that is divulged about these beasts is based on artistic license.
(photograph by the author, courtesy of the Royal Ontario Museum, Toronto.)

That same year, Peter Makovicky could assert that we are "living in the golden age of dinosaur discovery."[1] There are "six or seven new species described every year," claimed Paul Sereno. "Even though you'd think it might be slowing down, the pace of discovery has quickened."[2] And yet the questions these discoveries raised kept piling up.[3] Yes, we do know better, Zimmer repeated, "but dinosaurs remain highly mysterious."[4] It's "humbling how little we know," Hans-Dieter Sues confessed. "Most of the big questions have yet to be really answered."[5]

The word "dinosaur" comes from Latin, through the Greek *deinos* (terrible) and *sauros* (lizard)—thus "terrible lizard." Believing them to have been gigantic reptiles, it had been assumed that dinosaurs must have been cold blooded. But there have long been dissenting voices.

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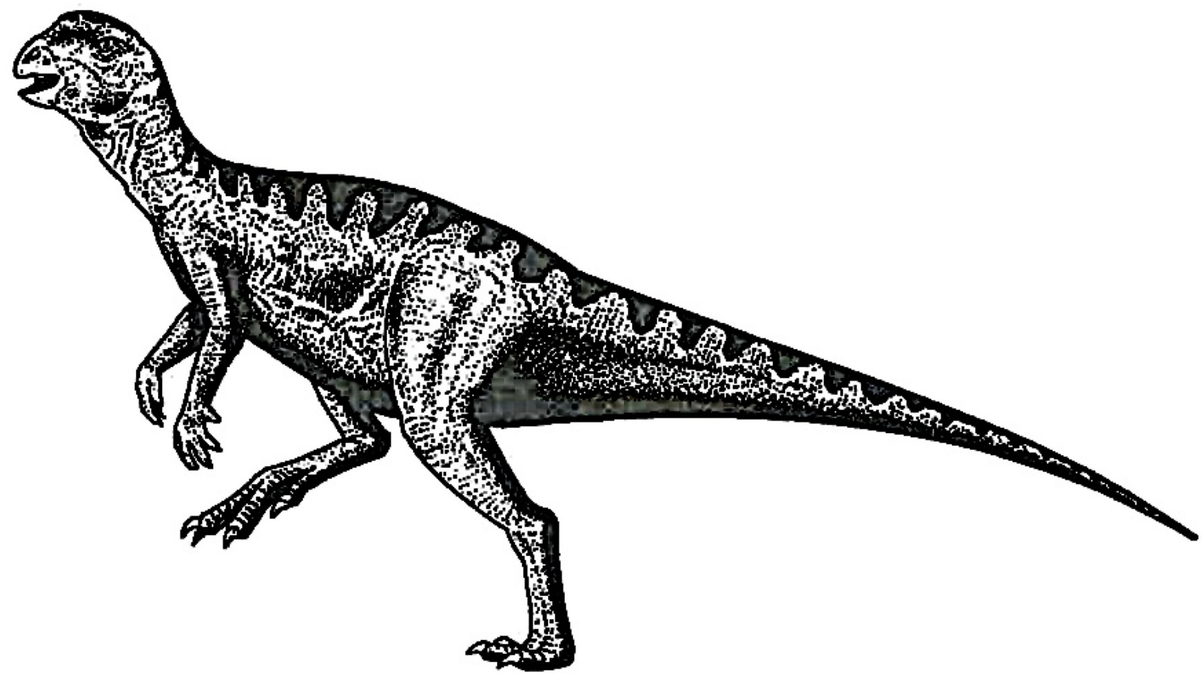
[1] "The Golden Age of Dinosaur Discovery," in *ibid.*, p. 31.

[2] C. Zimmer, *loc. cit.*

[3] "The Golden Age of Dinosaur Discovery," see above.

[4] C. Zimmer, *loc. cit.*

[5] *Ibid.*



Hypsilodon.
Such skin markings are based on nothing but guesses about the creature's supposed need for camouflage.
(Illustration by Bob Giuliani.)

THE ENDOTHERMIC CONTROVERSY

Immanuel Velikovsky was one of the first, if not the first, to suggest that not all dinosaurs were reptiles, that some of them must have been warm-blooded mammals. His theory was actually put to paper in two separate articles which date from 1941 and 1951 respectively. They were not, however, published until 1976 when Lewis Greenberg combined the two of them into a single article.[1] Heaven only knows how critics would have treated him had his theory come to the general attention of orthodox palaeontologists. Something of what that would have been like can be gleaned through the reception that was allotted Robert Bakker when he, too, presented identical views.

In 1968, while still an undergraduate at Yale University, Bakker, who was to become a renowned paleontologist, was already something of a heretic. Conducting an exhaustive study of dinosaur anatomy, he satisfied himself that the famed beasts resembled modern mammals and birds more than they did lizards. He therefore reasoned that dinosaurs were warm-blooded animals rather than the ungainly reptiles others were still vouching for.[2] It cannot, however, be said that his theories were received enthusiastically.[3] As he was quoted as saying some years later:

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[1] I. Velikovsky, "Were All Dinosaurs Reptiles?" *KRONOS* II:2 (November 1976), pp. 91 ff.

[2] R. Bakker, *The Dinosaur Heresies* (London, 1988), *in toto.*

[3] J. Robbins, "The Real Jurassic Park," *Discover* (March 1991), p. 54.

"I took a lot of heat for that work. The papers [he had published on the subject] were condemned as dangerous heresy. People didn't want to give up the image of dinosaurs as cold, slow, and lumbering."[1]

But his theory did not go the way of the dinosaurs themselves. It survived. John Ostrom,[2] from the United States, and Armand de Ricqlés,[3] from Paris, France, independently took up the subject, although this remained mainly within the halls of academia. The topic received its first public boost through the publication of Adrian Desmond's best-selling book.[4] In 1980, Malcolm Browne joined the ranks.[5] Even so, the theory was still far from being entrenched since there were still many adherents of the cold-blooded dinosaurs giving the warm-blooded theorists a good run for their money.[6] In the process some jumped from one band wagon to another. Jack Horner argued to no end with Bakker, sticking to his guns that dinosaurs were cold-blooded reptiles.[7] But his own discoveries eventually led him to agree with the endothermic nature of the beasts in question.[8] Not only that, but Horner was even successful in changing the minds of other palaeontologists who were still holding out for the ectothermic theory.[9] By 1988, we began to run into such statements as: "Some [dinosaurs] *may have been* warm-blooded, and a few—notably the brontosaur—*may even* have borne live young."[10] It cannot now be ascertained whether this last bit was a steal from Velikovsky, who had also suggested that brontosaurus "might have given birth to its young and did not lay eggs."[11]

The controversy was muddled further by certain basic facts that the endothermists had either ignored or glossed over as Heather Pringle made clear when she wrote that:

"Some mammals, for example, were not warm-blooded at all in the textbook sense: they weren't always able to raise their core temperatures above ambient temperatures. And some reptiles were not strictly cold-blooded. 'Sea turtles can raise their body temperature significantly,' says [Hans-Dieter] Sues, 'and yet in most other respects, sea turtles are good reptiles.' Today, scientific understanding of body-temperature control in animals is more complex than Bakker originally thought."[12]

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[1] *Ibid.*

[2] J. H. Ostrom, "Terrestrial Vertebrates as Indicators of Mesozoic Climates," *Proceedings of the North American Paleontological Convention* (1969), pp. 347-376.

[3] A. de Ricqlés, "L'histologie Osseuse Envisagée comme Indicateur da la Physiologie Thermique chez les Tétrapodes Fossiles," *Comptes Rendus de Academie Scientifique*, 268D (1969), pp. 782-785.

[4] A. J. Desmond, *The Hot Blooded Dinosaurs: A Revolution in Palaeontology* (N. Y., 1976), *in toto* (first published in Great Bnritain in 1975).

[5] M. W. Browne, "New Find Sharpens Great Dinosaur 'War'," *Ottawa Journal* (April 12, 1980).

[6] J. Page, "Dinosaur Daydreams," *Science 81* (May 1981), p. 88.

[7] V. Morell, "Announcing the Birth of a Heresy," *Discover* (March 1987), p. 33.

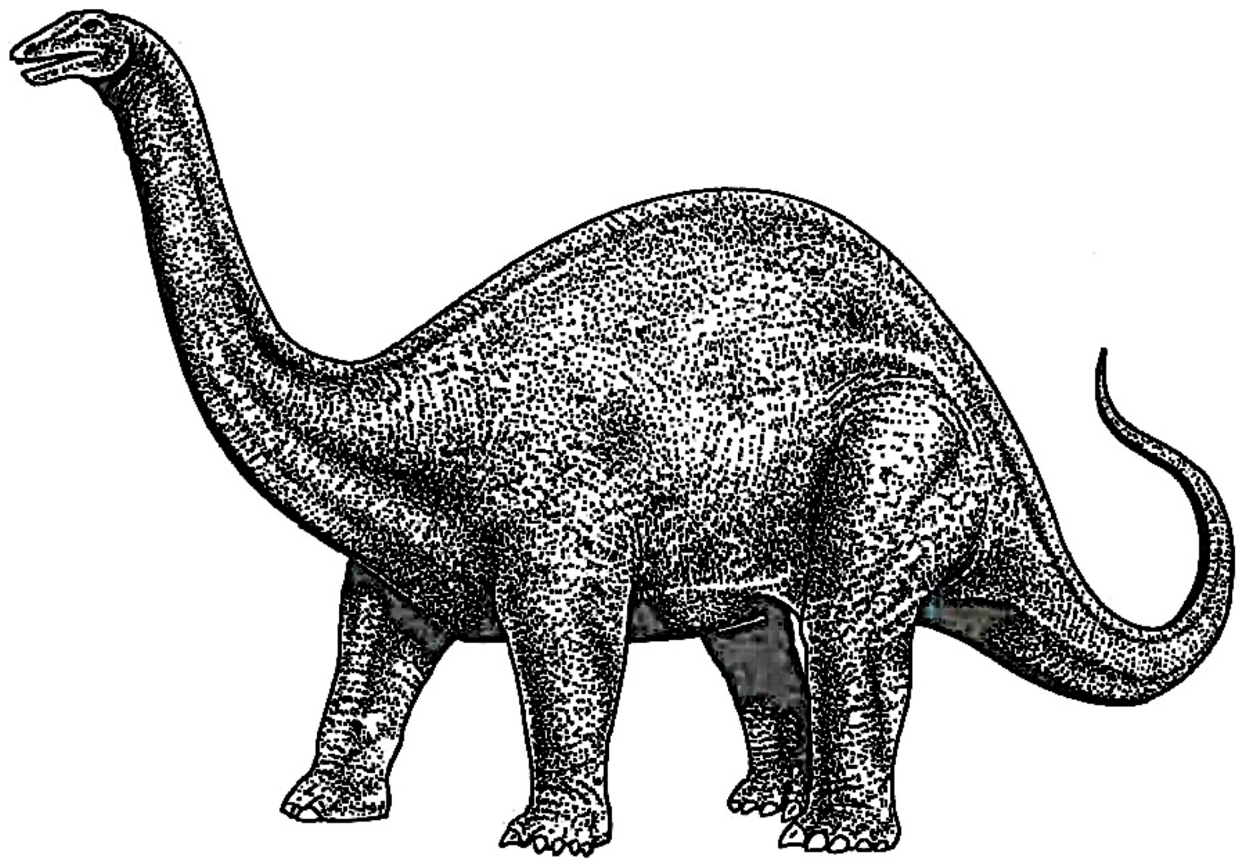
[8] *Ibid.*, p. 35.

[9] *Ibid.*

[10] P. Shipman, "Dinosaur Nests: Bringing Up Baby," *Discover* (August 1988), p. 49 (emphasis added).

[11] I. Velikovsky, *op. cit.*, p. 92.

[12] H. Pringle, "Dino Dilemmas," *Equinox* (December 1995), pp. 53-54.



Brontosaurs might even have given birth to live offspring.
Shown above: the brontosaur *Apatosaurus.*
(Illustration by Bob Giuliani.)

Or let us take another example. Dinosaur eggs have been discovered in *quantum sufficit*, and that has always been taken as an additional sign of the dinosaurs' reptilian nature. But not all reptiles are egg-laying creatures. Some are viviparous, giving birth to their young live and in a developed state. Nor do all mammals birth their young live. That aberration of nature, the duck-billed platypus, is an egg-laying mammal as are other Australian and New Guinea monotremes.

John Ruben was therefore right in pointing out that when extant endotherms are compared with extant ectotherms, the "supposed indicators of endothermy in dinosaurs can also be found in some extant ectotherms, while the same indicators are sometimes lacking in extant endotherms."[1] Thus, although he himself was in favor of warm-blooded dinosaurs, J. David Archibald was still forced to confess in 1996 that: "Endothermy in dinosaurs remains a hotly contested issue."[2]

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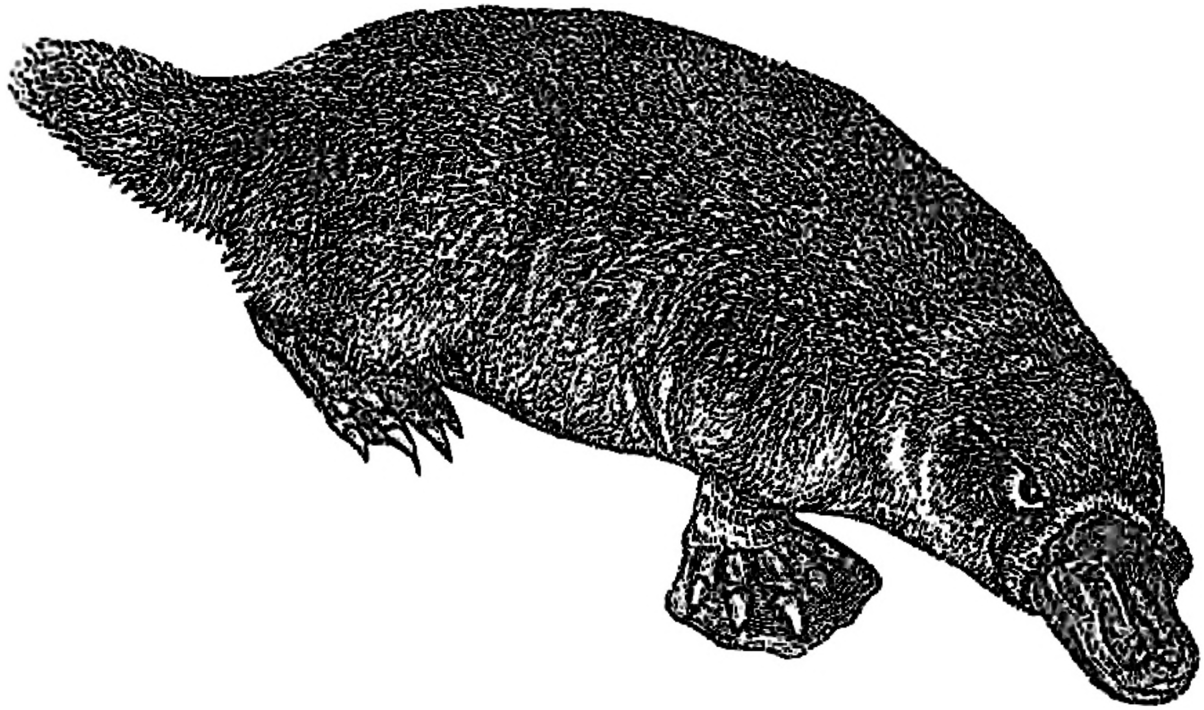
[1] J. D. Archibald, *Dinosaur Extinction and the End of an Era* (N. Y., 1996), p. 80.

[2] *Ibid.*, pp. 80-81.



The duck-billed platypus—an egg-laying mammal.

Further evidence was soon on its way. This came about when researchers at the North Carolina Museum of Natural Sciences discovered that one of their dinosaurs, a thescelosaurus, still had its heart in place. 3-D computer modeling revealed that the fossilized heart contained four chambers with a single systemic aorta. According to Canadian palaeontologist Dale Russell, this is "more like the heart of a mammal or bird than a reptile."[1] "This," Christine Kulyk noted, "suggests that thescelosaurus was warm-blooded, with a high metabolic rate, rather than cold-blooded like modern reptiles."[2]

But if the warm-blooded-dinosaur theorists thought that this discovery would clinch the matter, they were wrong. Skeptics not only questioned the CT evidence, but also its interpretation.[3]

Eventually Ruben tried a middle ground, speculating that dinosaurs could have been intermediate between cold-blooded and warm-blooded creatures, that they had mixed attributes of both metabolic styles.[4]

In the end, however, the jury remained out. As Pringle noted, "many researchers suggest we may never reach a clear understanding of this facet of dinosaur biology."[1] As of this writing, that is where this particular matter rests.

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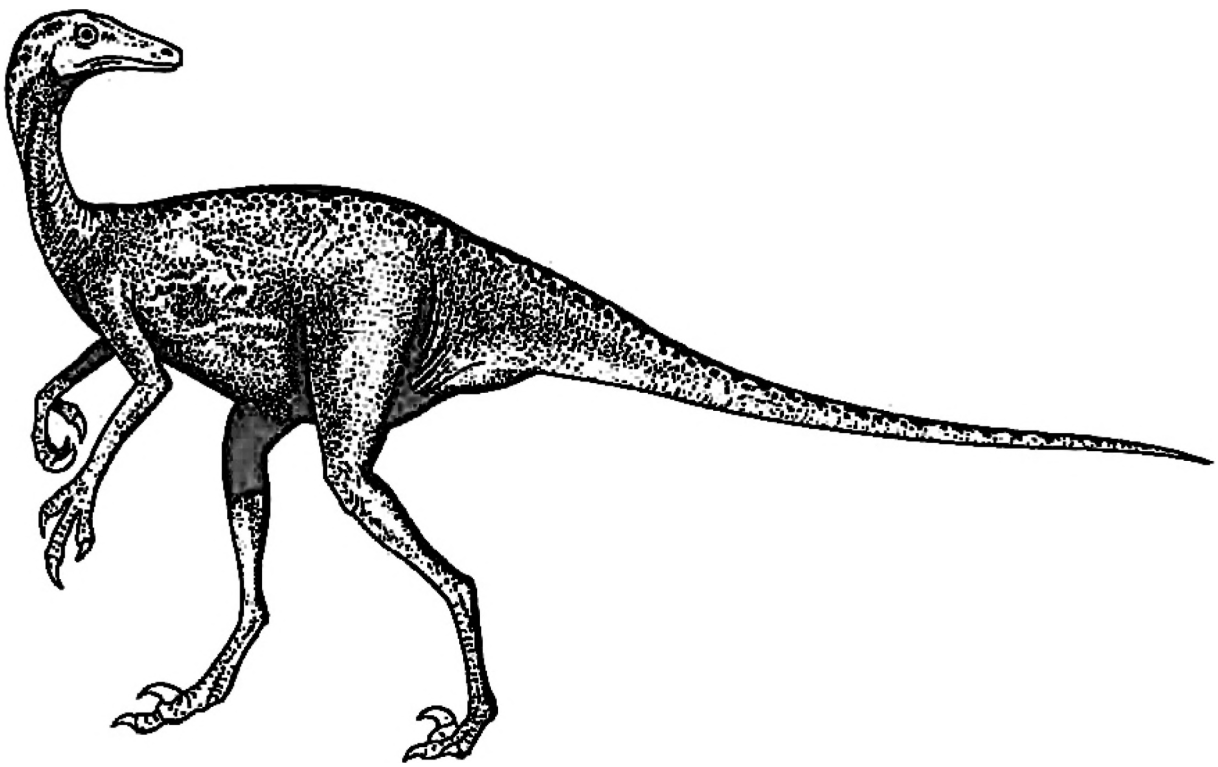
[1] C. Kulyk, "A Dino With a Heart," *Equinox* (September 2000), p. 20.

[2] *Ibid.*

[3] K. Wright, "Were Dinosaurs Warm-Blooded?" *Discover* (December 2000), p. 38.

[4] *Ibid.*, p. 40.



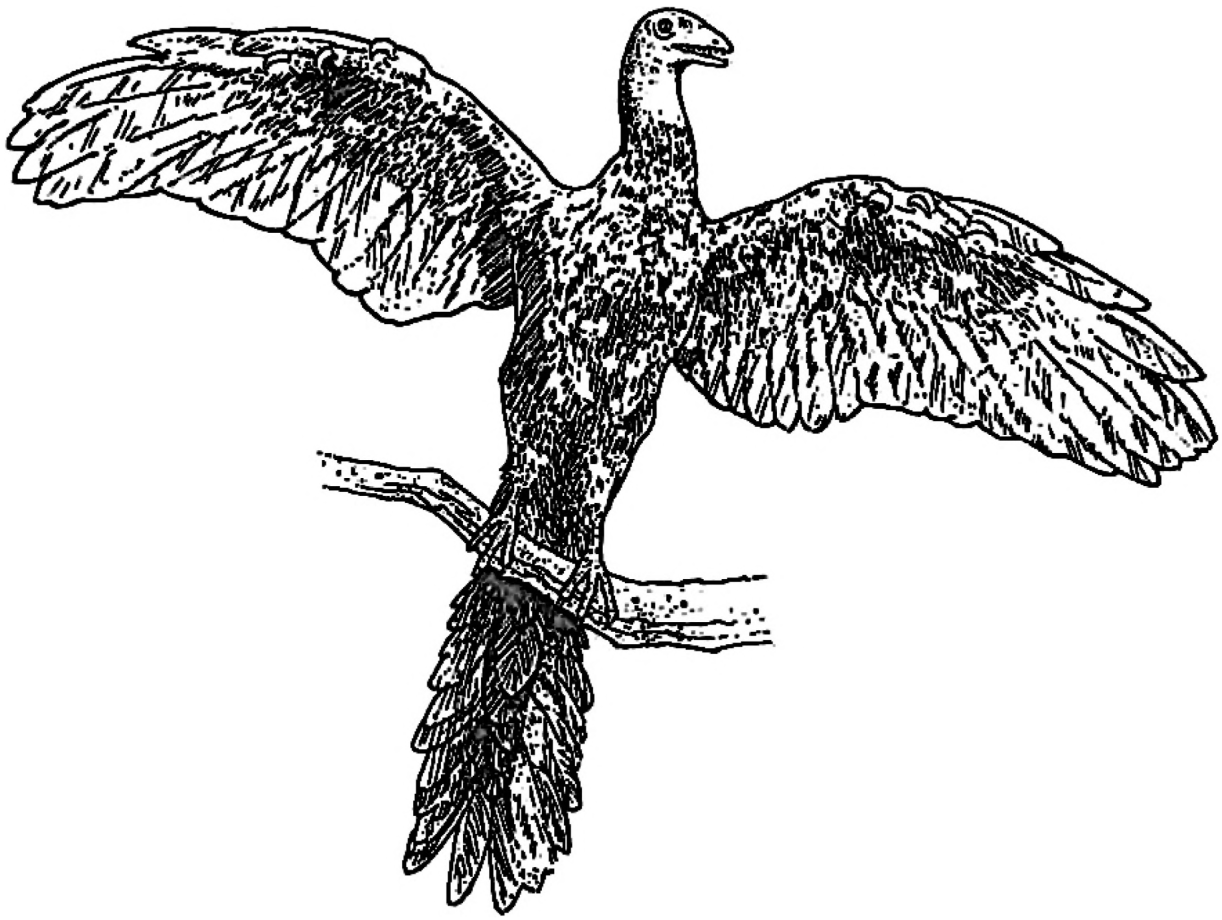
Anatomically, most bipedal dinosaurs resemble birds more than they do reptiles.
Shown above: *Stenonychosaurus.*
(Illustration by Bob Giuliani.)

THE ORIGIN OF BIRDS: AN UNSETTLED QUESTION

It had for long been apparent that, anatomically, as Bakker noted, bipedal dinosaurs resemble birds more than they do reptiles. It had, of course, also long been assumed that birds descended *from* dinosaurs. This assumption had been mainly based on the 1859 discovery of the fossilized remains of *Archaeopteryx*, a feathered bird with a toothed beak from the same period since no bird fossils from before that age had yet come to light. Originally this was touted as the best confirmation of Darwin's theory of evolution since it was seen as a link between reptiles and birds. As always, however, partly because the first remains of this creature from the slate beds of Solenhofen were incomplete, opponents of Darwin's theory scoffed at the evidence. Some of them even spread the rumor that the fossilized remains might be a fake.[2] But when, sixteen years later, a complete skeleton of the creature was unearthed from the lithographic slate beds of Eichstätt, the scoffers were sent packing. For a time there was even a difference of opinion as to whether these two finds, as well as others that were to fol-

[1] H. Pringle, *op. cit.*, p. 54.

[2] J. Augusta, *Prehistoric Animals* (London, 1967), p. 41.

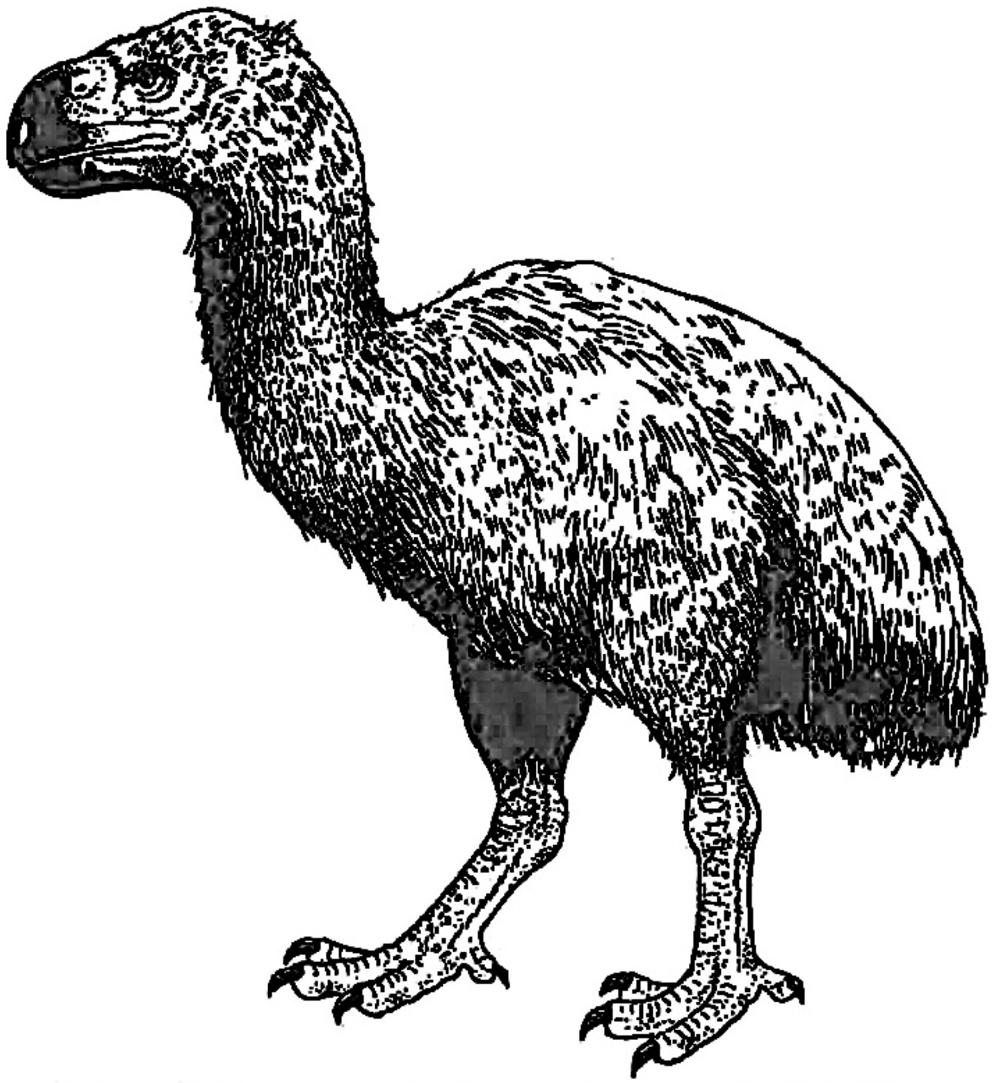


Archaeopteryx—for long touted as the earliest known bird.
(Illustration by Bob Giuliani.)

low, constituted one single species or two. Thanks to Gavin De Beer, the eventual verdict favored one and the same species.[1]

The remains of other toothed birds, entirely different from *Archaeopteryx*, which have been traced to the Cretaceous period, some aquatic, some not, were soon added to the list of discoveries.[2] Most of these fliers were pigeon sized, but not so with *Diatryma*, which did not fly at all, but which stretched nine feet tall. This, however, was in the Eocene epoch of the Tertiary period when the age of dinosaurs had already come to an end.[3] So likewise with the flightless six-foot tall bird named *Phororhacos* which thrived in the even later Oligocene

[1] *Ibid.*, Pl. 37.
[2] *Ibid.*, Pl. 38.
[3] *Ibid.*, Pl. 39.



The nine-foot tall flightless *Diatryma* from the Eocene epoch of the Tertiary period.
(Illustration by Bob Giuliani.)

epoch of the same Tertiary period.[1] And there were others, such as *Dinornis* of the Quaternary period, which attained an even greater height—a colossal eleven feet.[2]

But let us keep to the age of dinosaurs and, perhaps, a little further back. Bones of a theropod discovered in the Patagonia region of Argentina were once believed to have filled the gap between dinosaurs and birds. Its pelvis definitely resembles that of both creatures. Standing nearly four feet tall and about seven and a half feet long, the theropod, now named *Unenlagia comahuensis*, would have run upright on two legs. Lawrence Witmer, then from

[1] *Ibid.*, Pl. 40.
[2] *Ibid.*, Pl. 41.

the Ohio University, called *Unenlagia* "a true mosaic, begging the question of where to draw the line between what is, or is not, a 'bird'."[1] And yet, Fernando Novas, the discoverer of the fossil, "was careful to point out that the new find could not itself be a direct ancestor of modern birds, because *Unenlagia* lived just 90 million years ago—some 55 million years younger than *Archaeopteryx*," which was still being touted as "the earliest known bird."[2] But—yes you've guessed it—there was, again, no consensus of opinion. The discovery of *Unenlagia* did not impress those who were still skeptical of the dinosaur-bird theory. "They seem to dream 'em all up," said Alan Feduccia, who is both an ornithologist and evolutionary biologist from the University of North Carolina. His verdict was that it was all "[u]tter nonsense."[3]

> "Yes, birds superficially resemble dinosaurs [Feduccia went on]. But when you get down to the nitty-gritty, goblins start to creep out...I believe that the dinosaurian evolution of birds will be the greatest embarrassment of this century in paleontology."[4]

To which Novas countered with:

> "Can you put on the desk the evidence supporting that birds are not related to dinosaurs? Please do that and I will change my opinion."[5]

In the meantime, *Archaeopteryx*'s fame as the earliest-known bird did not go undisputed. Li Yumin, a farmer from the rural province of Liaoning, in China, was reported to have discovered the bones of what he said he thought was a *bona fide* dragon. But, as Ji Qiang, a leading ornithologist and head of the Chinese Geology Museum, was soon to announce, what Li Yumin had to show for his efforts was the world's oldest bird fossil. "Li found the fossil while excavating a site known to contain other bird-like creatures," said Ji.

Examining the fossil, which was named *Sinosauropteryx Prima*, in Beijing, Ji dated it more than 200 million years old, some 50 million years older than *Archaeopteryx*. Although it resembled a land dinosaur, *Sinosauropteryx* possessed a number of distinctive qualities. According to Ji, the "forelegs show a definite tendency to developing towards wings." What seems to have clinched the matter, however, was the discovery of feather imprints in the limestone in which the fossil was said to have been imbedded. But, despite its primitive wings and other bird-like features, *Sinosauropteryx* could not have flown. "It could only run with the support of its hind legs," said Ji, "just like an ostrich does."

No one, of course, had ever believed that a feathered wing could have developed overnight. And yet, as critics had argued, a still developing wing would not have benefited evolutionary progress. The bones of *Sinosauropteryx* came rather close to silencing those critics.

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[1] J. Schwartz, "Fossil Bolsters Dinosaur-Bird Link," *The Washington Post* (May 21, 1997), p. A01.
[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*

There was more to come, none of which fared well for Ji Qiang's reputation and that of others. How the bones of *Sinosauropteryx* came to the Western World is not quite clear. Whether true or not, reports have it that it was actually smuggled out of China into the United States where the specimen was triumphantly displayed at the National Geographic Society, which published an article on the so-called discovery in the November 1999 issue of their official organ.[1] Despite all this fuss, to the consternation of many, it was eventually discovered that the entire thing was nothing but a hoax perpetrated by Li Yumin, the farmer who had supposedly discovered it. He had manufactured the entire thing from bird parts and the tail of a land animal.[2] To my knowledge, no one ever counted the number of red faces this incident must have raised. Even *AEON*, with myself as Editor, had jumped the gun,[3] although we did set the record straight once the truth was out.[4] *National Geographic*, too, was honest enough to admit to its hastiness when it confessed that the incident involved "a tale of misguided secrecy and misplaced confidence, of rampant egos clashing, self-aggrandizement, wishful thinking, naïve assumptions, human error, stubbornness, manipulation, backbiting, lying, corruption and, most of all, abysmal communication."[5]

Archaeopteryx's fame as the earliest-known bird was again challenged when an entirely new contestant came upon the scene. Back in 1969 a fossil had been discovered in the former Soviet republic of Kyrgyzstan. In 1999, the fossil came on a loaned exhibit to the United States and was displayed at a shopping mall in Kansas, of all places. This gave American researchers a chance to study it. Led by John Ruben of Oregon State University, the examining team noted that the fossil "contained about eight pairs of long appendages with features resembling feathers." *Longisiquama*, as this specimen was named, is believed to be 220 million years old, 75 million years older than our friend *Archaeopteryx*. The problem with this is that while *Longisiquama* was a reptile, it was not really a dinosaur. And even then, *Archaeopteryx* continued to hold resolutely onto his title because, as always, there were those who disagreed. "Other paleontologists have criticized the assessment," Rebecca Lipsitz reported. "[T]hey argue that although the structures are indeed unique, they are probably scales, not feathers."[6]

Other researchers, however, were nonplussed. In fact they wanted to go further. What they were after was a more direct link between dinosaurs and birds. As already noted, dinosaur eggs have been found in quantity. Nests containing such eggs do not differ in appearance from modern birds' nests. Fair enough, the eggs are larger, but modern ostrich and emu eggs are not exactly small either. These dinosaur nests soon led to theories concerning parenting. At one site in Montana, fossils of dinosaur eggs belonging to the duck-billed *Maiasaura*, as well as hatchlings, juveniles, and adults of the same creature, have come to light. To Horner and Robert Makela, this site looked like a dinosaur nesting colony "where adults fed, nurtured, and

[1] C. P. Sloan, "Feathers for T. Rex?" *National Geographic* (November 1999), pp. 98 ff.

[2] J. Newman, "Twenty of the Greatest Blunders in Science in the Last Twenty Years," *Discover* (October 2000), p. 80.

[3] T. ta Maria, "Birds Linked to Dinosaurs," *AEON* IV:5 (November 1996), p. 122.

[4] *Idem*, "Feathered Dinosaurs and a Feathered Hoax," *AEON* VI:1 (February 2001), p. 45.

[5] L. M. Simons, "Archaeoraptor Fossil Trail," *National Geographic* (October 2000), p. 128.

[6] R. Lipsitz, "Down With Dino Birds?" *Scientific American* (September 2000), p. 32.

Dinosaur eggs.
(Photograph by the author.)

even defended their young."[1] It is not, however, easy to convert those who have for long been preaching their own brand of scientific truth. Thus there were those who pointed out, and rightly so, that "the combination of eggs, hatchlings, and adults also occurs in the breeding sites of turtles—who provide no care at all for their young."[2] And yet, as Heather Pringle pointed out:

> "...palaeontologists trace evolutionary relationships between animals by comparing certain key anatomical features. Animals that share many of these key features are close kin; animals that don't are more distantly related. Birds and dinosaurs, for example, possess more than 125 of these shared derived characters, including a unique kind of ankle joint and upright or erect limbs—which has convinced even conservative dinosaur researchers that the two groups are intimately related."[3]

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[1] H. Pringle, "The Real Deal on Dinos," *Equinox* (December 1995), p. 55.

[2] *Ibid.*

[3] *Ibid.*

Dinosaur embryo.
(Photograph by the author.)

Thus, as Pringle whimsically adds:

> "Palaeontologists have news for you—the turkey that roasts in the oven on Christmas Day is a dinosaur. And so is the robin that yanks out worms from your lawn in spring. Birds, in other words, are living dinosaurs."[1]

But that birds are living dinosaurs is one thing, that dinosaurs were living birds is quite another. Links between them might be valid. Descent of one from the other might also have been possible. But there yet remained no direct evidence that dinosaurs, or at least some of them, were actually nothing but gigantic flightless birds. Yet more surprises were on the way.

Concentrating on bipedal duck-billed types, Horner and his colleagues examined fossil embryos and hatchlings from three different types of these creatures. They wanted to find out how fast they grew. As hatchlings, these plant eating dinosaurs "were hardly bigger than toy poodles," but they grew to 30-foot-long specimens. Horner's opinion was that there is "almost nothing you can think of as vulnerable as a 16-inch-tall duck billed dinosaur." Which *is*

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[1] *Ibid.*

something of an exaggeration. But we'll give him that much. Knowing that a large blood supply denotes fast growth, Horner and his colleagues counted the number of microscopic blood vessels in that part of the bone containing the marrow and compared it to embryonic bone from modern alligators, ostriches, and emus.[1]

> "The dinosaur had even more vascular space than the birds [Horner reported]. It looks like they grew up to somewhere between nine and 12 feet long in just one year. In other words, birds didn't invent this method of growth. It was invented by their dinosaur ancestors."[2]

None of this impressed Feduccia. When Kathy Svitil asked him in an interview for the February 2003 issue of *Discover* why he did not believe that birds are descended from dinosaurs, he replied with:

> "First, the time line is all wrong. These alleged dinosaurian ancestors of birds occur 25 million to 80 million years after *Archaeopteryx*, [whom he still considered to be] the earliest known bird. Second, by the time you get to dinosaurs, you are dealing with fairly large, earthbound creatures, which means they would have had to evolve flight from the ground up, rather than from the trees down. Evolving flight from the ground up is biophysically implausible. Third, many of the features of birds and dinosaurs—the hands and teeth for example—don't match."[3]

Was this enough to kill the birds-from-dinosaurs controversy? Hardly.

SCALES VERSUS FEATHERS

All reptiles possess scales. But then, as J. Archibald informs us, so do some birds and even mammals.[4] No, you will not find a bird or a mammal that is entirely covered in scales, since even the pangolin's horny scales are actually composed of cemented hairs rather than the keratinized outer layers of the epidermis as in reptiles. That is why snakes can shed their scaly skins while pangolins cannot. It is therefore obvious that Archibald was exaggerating a bit. What he had in mind were such traits as the tails of rats and the legs of birds both of which appendages are covered in actual scales.[5]

> "Probably the best example is the leg of a penguin [he then tells us]. Going down the legs, feathers merge imperceptibly into scales. This is also true for the front of a penguin's wing...Living penguins are strong support for the argument that feathers are evolutionary derivatives of scales."[6]

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[1] K. A. Svitil, "Dinosaur on the Grow," *Discover* (April 2000), p. 22.

[2] *Ibid.*

[3] A. Feduccia & K. A. Svitil, "Plucking Apart the Dino-Birds," *Discover* (February 2003), p. 16.

[4] J. D. Archibald, *op. cit.*, p. 22.

[5] *Ibid.*

[6] *Ibid.*

All of which is in keeping with Gould's belief that:

"...feathers may have evolved from reptilian scales for an initial function in thermoregulation—and only later were they co-opted for flight when they became numerous and elaborate enough to provide aerodynamic advantages...Thus, structures evolved to retain heat have a latent potential for use in flight—an originally unexpected capacity that may become important as the organs get more elaborate or as environmental conditions change."[1]

And if mammals and birds can have parts of their bodies covered in scales, why couldn't reptiles have parts of their bodies covered in feathers? Needless to say, no such beasts are known at present, but this is not to say that there never were such creatures. And if so, they were bound to be found. Had they not been searched for by those who still held to the birds-from-dinosaurs theory? Does not evidence always seem to spring up in favor of a theory when looked for by the concerned theorists? It was therefore not much of a surprise when Phil Currie and Ji Qiang reported the discovery in China of two small dinosaurs—*Caudipteryx* and *Protoarchaeopteryx*—that sported what very much looked like feathers. What is perhaps more interesting is that one of these dinosaurs, the *Caudipteryx*, is a small ancestral relative of the well-known *Tyrannosaurus Rex*.[2]

"These two new animals [said Currie] are part of a group of dinosaurs called coelurosaurs. *Velociraptor* [of *Jurassic Park* movie fame] is also one of these, as are all the ostrich-mimic dinosaurs that keep getting confused with baby tyrannosaurs. The interesting thing is that tyrannosaurs are actually more closely related to these dinosaurs than they are to massive carnivores like *Allosaurus*."[3]

"Despite their size [Josh Fischman added], tyrannosaurs share a lot of birdlike features with the smaller dinos. These tiny Chinese dinosaurs lived 50 million years or so before tyrannosaurs made the scene. So if they had feathers, and modern birds have feathers, it's quite possible that tyrannosaurs, falling on a family-tree branch somewhere in between the other two groups, had them as well."[4]

It is true enough that the feathers associated with *Caudipteryx* are "the wrong shape and in the wrong place to have anything to do with flight." But if these creatures hung out in packs, as Currie opines, they would have been involved in some sort of social behavior, including courtship and threat displays. Whether to attract females or intimidate males, peacock-like fans spreading out from tails would have filled the bill.[5]

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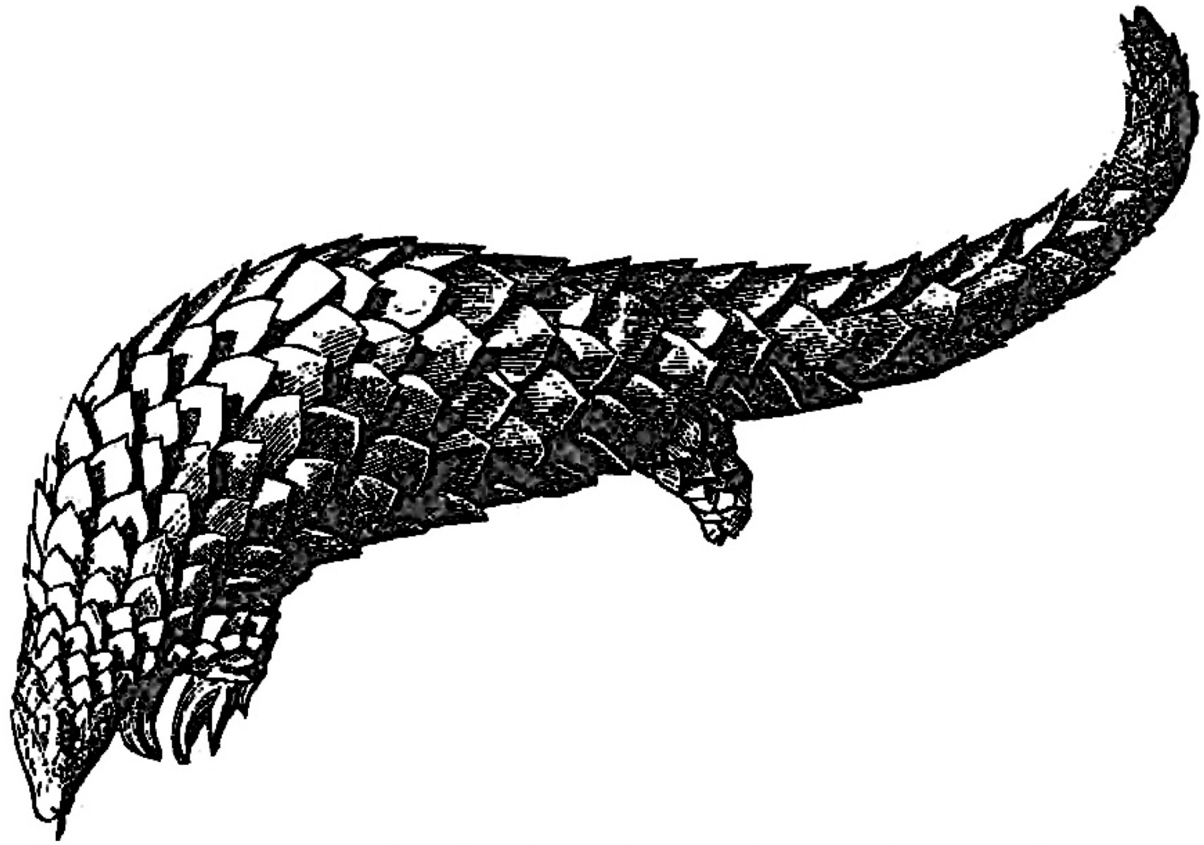
[1] T. ta Maria, *loc. cit.*

[2] J. Fischman, "Tyrannosaur Feathers?" *Discover* (May 1999), p. 75.

[3] *Ibid.* (Actually, *Velociraptor* lived during the later Cretaceous, as did most of the *Jurassic Park* dinosaurs.)

[4] *Ibid.*

[5] *Ibid.*



Although the pangolin is often classed as a scaled mammal, its horny scales are actually composed of cemented hairs rather than the keratinized outer layers of the epidermis as in reptiles.

It did not much matter that the Chinese province in which these "feathered" dinosaurs were found was the same in which the previous hoax, described above, had come to light. And while it is not my intention to cast additional aspersions on his reputation, it did not matter that the Chinese palaeontologist who discovered them was the same Ji Qiang (or Qiang Ji) who had certified that faked specimen as a genuine feathered dinosaur. The show simply went on.[1]

With their usual "poetic license," it did not take long for artists to start portraying *Velociraptor*, to say nothing of "a baby T. rex," adorned with feathers.[2] Even the famed American Museum of Natural History in New York set up a painted re-enactment and a separate diorama to display this new breed of *Velociraptor*. "A multicolored frill graces [*Velociraptor*'s] pate," Weed describes these exhibits, "and the rest of its body is covered in a fluffy sheath of unusual feathers that dinosaur artists have come to call dinofuzz—definitely not fur, but not quite feathers either." The feathers, Weed tells us, were the idea of Mark Norell, the

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[1] See here, for instance, C. Rist, "The Proof is in the Plumage," *Discover* (January 2002), p. 45.

[2] W. S. Weed, *op. cit.*, pp. 77, 78, 79.

curator of vertebrate palaeontology at the museum.[1] But, as Weed also tells us, the feathers were not required by direct fossil evidence, since all there was so far was a "debatable set of quill-like impressions around some fossil finds." But to Norell, it was "important to read these as feathers all over the body because the major thrust of his work as a scientist [was] to show that dinosaurs are direct ancestors of modern birds."[2]

In March of 2002, Norell, who journeyed to China's Liaoning province to see for himself, reported the discovery of yet another "feathered" relative of *Velociraptor*, three feet in length. As it was claimed, there was no doubt this time that what the fossil flaunted were not merely quill-like impressions. Its arms, legs, and tail, it was reported, "were covered with feathers identical to those on modern birds."[3] As described by Jeffrey Winters:

> "...the fossil reveals it was covered with plumage, including feathers that extended out at least seven inches along the tail. It could not fly, however; the feathers were most likely used for insulation or display."[4]

However, as always, not everyone was convinced.

> "There are scores of fake fossils out there [Feduccia stated in the above mentioned interview], and they have cast a dark shadow over the whole field. When you go to these fossil shows, it's difficult to tell which ones are faked and which ones are not. I have heard that there is a fake-fossil factory in northeastern China, in Liaoning Province, near the deposits where many of these recent alleged feathered dinosaurs were found."[5]

And:

> " The Chinese fossil trade has become a big business. These fossil forgeries have been sold on the black market for years now, for huge sums of money. Anyone who can produce a good fake stands to profit."[6]

But Norell was not to be put down. "The people who say these [fossils] are fakes aren't taken seriously by the professional community," he parried. ""They are basically in the flat-earth zone."[7]

> "People have accepted that these filamentous structures—dino fuzz—represent proto-feathers [Feduccia told Svitil]. But these things do not resemble feathers, and I don't

[1] *Ibid.*, p. 79.

[2] *Ibid.*

[3] J. Winters, "A Dinosaur in Bird's Clothing," *Discover* (January 2003 Special Issue), p. 31.

[4] *Ibid.*

[5] *Ibid.*; A. Feduccia & K. A. Svitil, *loc. cit.*

[6] *Ibid.*

[7] J. Winters, *loc. cit.*

Even *Velociraptor*, shown above, was eventually clad with feathers by palaeontologists.
(Illustration by Bob Giuliani.)

think they have anything to do with feathers. To me, they look like preserved skin fibers."[1]

And to me, it has always seemed that when evidence favors a personal theory it is accepted by the theorist; when not, the evidence is called into question—it is either not good enough or, when it appears to be good enough, judged to be a fake. It also seems to me that Feduccia was trying to claim both. If the evidence is not good enough, it must at least be genuine. If the evidence is judged a fake, why bother claiming it's not good enough?

One thing Norell was right about is that the professional palaeontological community did not take Feduccia seriously. By 2003, the verdict was in: Feathers evolved in dinosaurs before the appearance of birds.[2]

"Progress in solving the particularly puzzling origin of feathers has...been hampered by what now appear to be false leads, such as the assumption that the primitive feather evolved by elongation and division of the reptilian scale, and speculations that feathers evolved for a specific function, such as flight," reported Richard Prum and Alan Brush. "A lack of primitive fossil feathers hindered progress as well."[3] But, as they continue and we already partly know:

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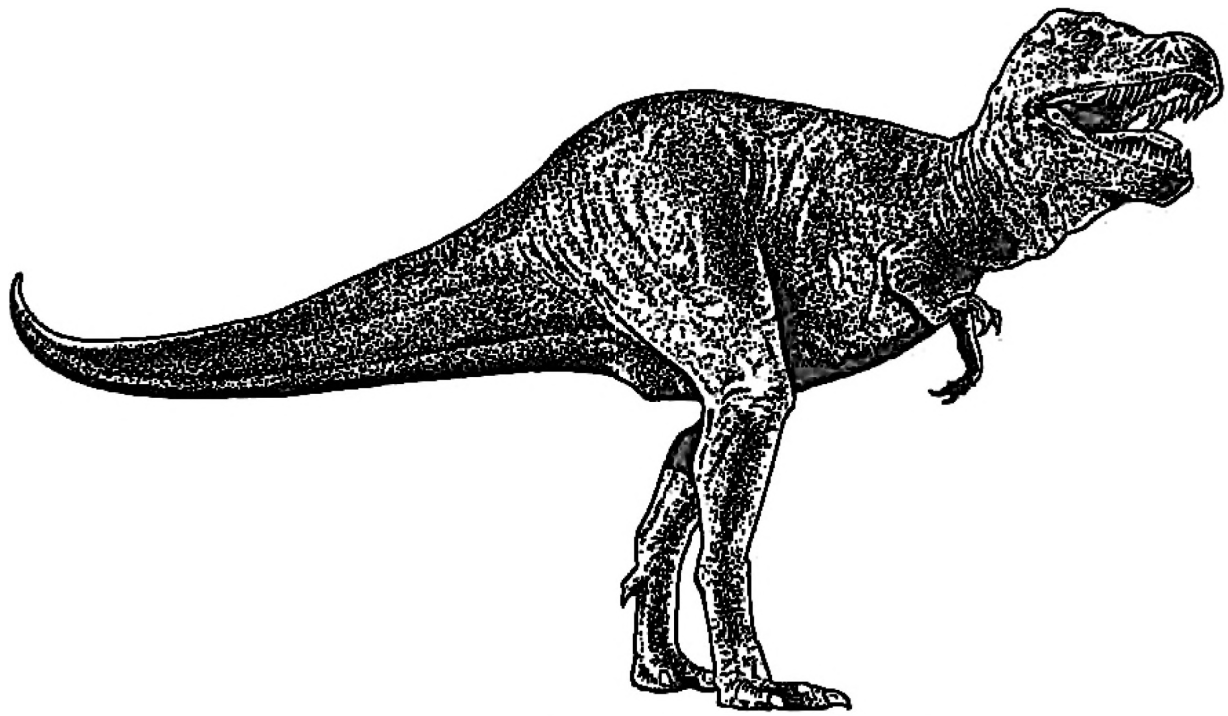
[1] A. Feduccia & K. A. Svitil, *loc. cit.*

[2] R. O. Prum & A. H. Brush, "Which Came First, the Feather or the Bird?" *Scientific American* (March 2003), p. 86.

[3] *Ibid.*



***Tyrannosaurus rex*, too, was eventually endowed with feathers.**
(Illustration by Bob Giuliani.)

"...paleontologists have unearthed a trove of feathered dinosaurs in China. These animals have a diversity of primitive feathers that are not as highly evolved as those of today's birds or even *Archaeopteryx*."[1]

It is reports like these that tend to confuse. Are these so-called feathers "identical to those of modern birds," as previously reported, or are they "not as highly evolved as those of to-day's birds"? Could Feduccia have been right, at least to some extent, after all?

"[These 'primitive feathers'] give us critical clues about the structure, function and evolution of modern birds' intricate appendages [Prum and Brush continue]. Together these advances have produced a highly detailed and revolutionary picture: feathers originated and diversified in carnivorous, bipedal theropod dinosaurs before the origin of birds or the origin of flight."[2]

And:

"New fossil discoveries have continued to close the gap between birds and dinosaurs and ultimately make it more difficult even to define birds. Conversely, many of the

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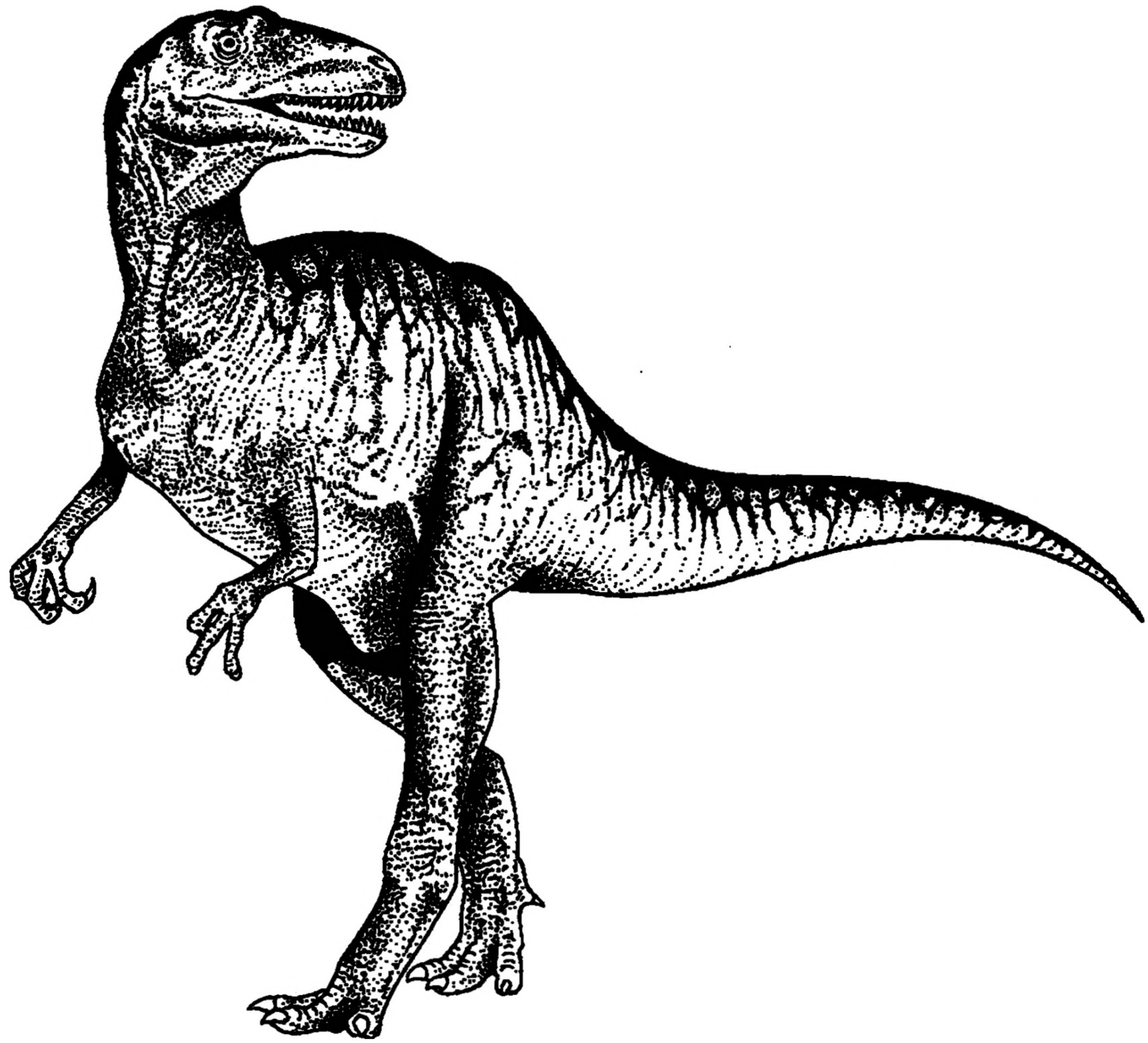
[1] *Ibid.*
[2] *Ibid.*



Despite looks, it has been decided that *Allosaurus*, shown above, is no close kin to *Tyrannosaurus rex*. Does this exclude him from the feathered-dinosaurs club?
(Illustration by Bob Giuliani.)

most charismatic and culturally iconic dinosaurs, such as *Tyrannosaurus* and *Velociraptor*, are very likely to have had feathered skin but were not birds."[1]

That feathers evolved from elongated reptilian scales also came heavily under fire when it was shown, *as it should much earlier have been*, that scales and feathers develop in an entirely different manner.[2] So much for Gould's earlier belief to the contrary. Thus, the issue

[1] *Ibid.*, p. 92.
[2] *Ibid.*, p. 93.

of *Scientific American* that carried the article under review not only unabashedly illustrated both the article and its cover with realistic reconstructions of feathered dinosaurs, but also a diagram of the evolving stages in the evolutionary progress from featherless to feathered dinosaurs and ultimately to birds.[1] Also included were pictorial side-bars illustrating the nature of feathers and the manner in which they grow.[2] While this was educational, the additional side-bar which portrayed the evolution of feathers from a primitive hollow cylinder was described by the authors themselves as stemming from their own particular theory.[3]

Newer discoveries then added to all this. The newer claim was that not only have feathers evolved before birds, but so did *flight* feathers. Researchers from the Institute of Vertebrate Paleontology and Paleoanthropology of the Chinese Academy of Sciences reported the discovery of a new feathered dinosaur which possessed the imprints of modern-looking asymmetrical flight feathers. Given the name of *Microraptor gui*, the creature's feathers formed front and hind "wings," with the feathers being "more asymmetrical toward the end of the limb, just as occurs on the modern bird wing." The interesting thing about this is that asymmetrical feathers are "the only kind of feathers useful for flight."[4]

> "In fact, such feathers were one of the few unique characteristics that distinguished the avian descendants from their dinosaur forebears. Now it appears that even flight feathers, not merely feathers per se, existed before birds."[5]

But that was not yet the end of the affair. There were yet more discoveries to come from China's Liaoning Province. One was a 53 centimeter-long skeleton of a dinosaur that had died in its sleep. Dated to 135 million years ago, it was found "curled up in a stereotypically bird-like way with its head tucked under a limb." Another consisted of an actual bird only relatively slightly younger than *Archaeopteryx*, that had obviously died before it hatched. Dated to 120 million years ago, it "was better developed than today's birds are before hatching" suggesting that "birds of that era were more like dinosaurs, in that they could function on their own as soon as they were born."[6]

One cannot help wonder what happened to the previous theory developed from the nature of those dinosaur nesting colonies that were said to indicate parenting "where adults fed, nurtured, and even defended their young." But no matter—the issue had been resolved.

One other thing Feduccia pointed out is that *all* of the fossils that have been interpreted as the remains of feathered dinosaurs had, until then, come to light in China's Liaoning Province. (Let us even put aside the fact that the first such fossil from this Province turned out to be a hoax.) But as the years went by, other discoveries, while still within Chinese jurisdictions, did surface outside the Liaoning locality. "The remains of a giant, birdlike dinosaur as tall as the formidable tyrannosaur have been found in China," an Associated Press release reported in

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[1] *Ibid.*, pp. 90-91

[2] *Ibid.*, pp. 88-89.

[3] *Ibid.*, pp. 90-91.

[4] The Editors, "Dinosaur or Bird? The Gap Narrows," in *ibid.*, p. 93.

[5] *Ibid.*

[6] "Dinosaur Discoveries," *Focus* (January 2005), p. 17.

June of 2007.[1] But this one came from the Erlian Basin of northern China's Inner Mongolia. Said to have been 26 feet long, 16 feet tall, and calculated to have weighed 3,000 pounds, it has been dubbed *Gigantoraptor erlianensis*. Its birdlike features included slender legs and what passed for a beak, but when it came to feathers it was said it only "likely" had them.[2] "That puts the Gigantoraptor's existence at odds with prevailing theories that dinosaurs became smaller as they evolved into birds and that bigger dinosaurs had less birdlike characteristics," said Xu Xing, a paleontologist from Beijing. "It is very important information for us in our efforts to trace the evolution process of dinosaurs to birds," he went on. To which he added that: "It's more complicated than we imagined."[3]

While feathered dinosaurs continued to turn up in China's Liaoning Province, [4] Asia's monopoly was bound to be broken. Valid or not, a feathered dinosaur was eventually claimed for New Mexico's Zuni Basin.

> "Now described and named *Nothronychus mckinleyi* [Heather Pringle reported], the new therizinosaur [as it has been classed] is the largest of the dinosaurs identified so far [that is in 2001] in Zuni Basin. Measuring 20 feet in length *from the top of its feathered head* to the tip of its stout tail, it almost certainly walked upright—like Godzilla—rather than tilted over in a posture apparently favored by its celebrated relative *T. rex*...It also *was likely covered in shaggy plumage like an emu* and had a tiny beaked head equipped with miniature serrated teeth."[5]

To be sure, however, the "feathered head" and "shaggy plumage" were conjectured on the resemblance *Nothronychus* bore to those previously discovered feathered dinosaurs in China. These conjectures, moreover, were forwarded by none other than Currie and Norell, who had been involved in the original controversy concerning those very same feathered dinosaurs from China .[6] In other words, the Zuni Basin specimens do not show any signs of feathers. Another so-called feathered dinosaur was also discovered at Cedar Mountain in Utah.[7] All of which kept strengthening the theory that birds evolved from dinosaurs. Nor did it take long for the theory to be promoted to reality. "We even *know*," Zimmer wrote quite early on, "that the 9,000 species of birds all around us are living, feathered dinosaurs."[8] And in July of that same year, this revelation was voted the "most important development in the field of paleontology."[9]

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[1] A. Ang, "Remains of Giant Dinosaur Found in China," *Associated Press* release (June 13, 2007).

[2] *Ibid.*

[3] *Ibid.*

[4] C. Zimmer, *op. cit.*, p. 38; C. Tarpy, "Jewels in the Ash," *National Geographic* (August 2005), pp. 88, 92, 94; "The Golden Age of Dinosaur Discovery," see above.

[5] H. Pringle, "The Creature from the Zuni Lagoon," *Discover* (August 2001), p. 46 (emphasis added).

[6] *Ibid.*

[7] "Feathered Dinosaur Found," *Cosmos* (July 2005), p. 21.

[8] C. Zimmer, *op. cit.*, pp. 32, 38 (emphasis added).

[9] K. Padian, "Think Tank," *Discover* (July 2005), p. 69; M. Norell, in *ibid.*, p. 72.

But how feather-like *are* these feathers—or proto-feathers, if you like? Some have described them both as "shaggy" and as "hair-like."[1] And then, what has been interpreted as the imprint of feathers in one specimen[2] looks suspiciously similar to what has been touted as the impression of fur in another.[3] Even so—fair being fair and feathers aside—some dinosaurs looked so much like birds that the remains of one of them, *Scipionyx samniticus*, was initially mistaken for one. As one reporter for *Discover* noted, those first impressions weren't all that far off.[4]

It is not that I wish to depreciate all that palaeontologists have been achieving in this particular field. I do realize that trial and error is the very nature of the scientific method—and I hope no one will overlook this fact when judging the present work—and this should be applauded. But even if one considers that those *against* the presently accepted theory of warm-blooded feathered dinosaurs are in the minority, *some* of the objections they have raised should not be laughed out of court. After all, how many times has science been certain of particular "truths" only to discover the error of the logic that led to them? The only thing I can safely say concerning the issue at hand is that, as of this writing (2007), when all is said and done, a consensus of opinion has not yet been reached. But then, is it ever?

PRESERVATION VERSUS AGE

Hell broke loose when, in May of 2002, Jack Horner attempted to transport the fossilized remains of a *Tyrannosaurus rex* newly unearthed in Hell Creek, Montana. Weighing in at two tons, the dinosaur's femur proved too heavy for the helicopter Horner had hired. He therefore had to break the bone in half to facilitate haulage. Some time later he shipped some resulting bone fragments from the broken femur to Mary Schweitzer at North Carolina State University. What Schweitzer realized the minute she unpacked the samples was that the fragments contained an inner layer of medullary bone which is normally displayed by ovulating female birds. This not only solidified the dinosaurs' avian link, it also established that the *Tyrannosaurus* in question had been pregnant.[5]

Eventually, collagen proteins extracted from the bone that were sequenced by Schweitzer's team turned out to be similar to chicken collagen, "adding to the mountain of evidence" that dinosaurs *are* most closely related to birds.[6] Not only that, but while working on another *Tyrannosaurus* skeleton retrieved from the same Hell Creek beds, Schweitzer noticed that the fossil reeked with a cadaverous odor. When, however, she reported this to Horner, he nonchalantly informed her that all the Hell Creek bones smelled that way.[7]

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[1] "Feathered Dinosaurs Found," see above.

[2] M. Norell, "The Dragons of Liaoning," *Discover* (June 2005), p. 58.

[3] *Ibid.*, p. 62.

[4] J. Barone, "Did T. Rex Taste Like Chicken?" *Discover* (August 2007), p. 16.

[5] E. Kleeman, "T. Rex Sex," *Discover* (September 2005), p. 10.

[6] *Ibid.*; J. Barone, *loc. cit.*; "Brave New World," *Discover* (April 2006), p. 35.

[7] B. Yeoman, "Schweitzer's Dangerous Discovery," *Discover* (April 2006), p. 38.

Biblical creationists did not take long in embracing Schweitzer's discovery.[1] Soft tissue inside a petrified bone was seen by them as proof that dinosaurs lived much more recently than claimed. "This discovery," wrote Carl Wieland, "gives immensely powerful support to the proposition that dinosaur fossils are *not* millions of years old at all, but were mostly fossilized under catastrophic conditions a few thousand years ago at most."[2]

This created something of a problem for Schweitzer since, besides being a pioneering paleontologist, she also happens to be a devout evangelical Christian. And this has prompted some of her peers to view her research with skepticism.[3] She, on the other hand, was just as mystified as everyone else.

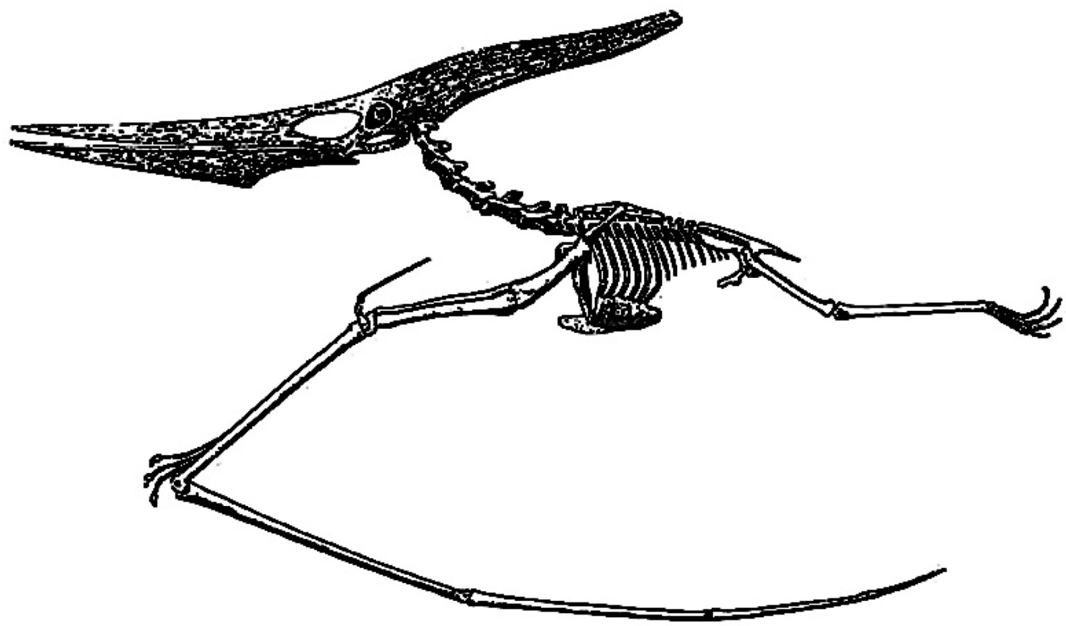
> "Everyone knows how soft tissues degrade [she noted]. If you take a blood sample and you stick it on a shelf, you have nothing recognizable in about a week. So why would there be anything left in dinosaurs?...This isn't happening. This is just not happening"[4]

While others hope that someone, someday, might be able to extract DNA samples from such bones, Schweitzer herself doubts it. Despite some reports to the contrary, she herself "hasn't even bothered to look for DNA."[5] If ever recovered, her opinion is that such DNA samples would be "fragmented and incomplete."[6] But even if that miracle could come to pass—even if, somehow, a living dinosaur could be hatched—she is of the opinion that such a creature would not survive for long. "As far as we know," she said, "the way the lung tissue functioned, the way the hemoglobin functioned, was designed for an atmosphere that's very different than today's."[7] Strengthened through molecular paleontology, a discipline which she herself had pioneered, her pronouncement is much in keeping with our scheme since, as noted time and again in our unfolding scenario, Earth's atmosphere would certainly have been different when our world was still a satellite of proto-Saturn. And this would certainly have affected the flight abilities of pterosaurs.

GIANTS ON THE WING

Up until the late 1960s, the largest known specimen of that class of prehistoric flying reptiles known as pterosaurs was *Pteranodon.* Described by Adrian Desmond as a creature that "was literally all wings," this air-borne denizen boasted a wing-span "which probably exceeded twenty three feet from tip to tip, while its diminutive body was no larger than a modern turkey.[8] But then, beginning in 1972, "a spectacular series of finds" by Douglas

[1] *Ibid.*, p. 40.
[2] *Ibid.*, p. 37 (emphasis as given).
[3] *Ibid.*, pp. 37, 40.
[4] *Ibid.*, pp. 39-40.
[5] *Ibid.*, p. 77.
[6] *Ibid.*, pp. 41, 77.
[7] *Ibid.*, p. 77.
[8] A. J. Desmond, *The Hot-Blooded Dinosaurs* (N. Y., 1976), p. 177.



Skeleton of *Pteranodon* whose wings, when outstretched, would have measured some 23 feet—dwarfed by later discoveries.

Lawson revealed the one-time existence of pterosaurs "that must have dwarfed even *Pteranodon*." Discovered in the Big Bend National Park in Brewster County, Texas, this new breed was calculated to have had wing-spans measuring over *fifty feet*."[1]

Because the remains of these creatures were discovered in "rocks that were 250 miles *inland* of the Cretaceous coastline," plus the lack of lake deposits in the vicinity,[2] these flying reptiles could not have captured fish while on the wing. Lawson himself suggested that they were carrion feeders, but this raised the problem of how these creatures could have taken off from level ground. As Lawson himself admitted: "Wings of such an extraordinary size could not have been flapped when the animal was grounded." Lawson's own suggestion was that since they were "unable to run in order to launch themselves they must have taken off vertically," but the "lack of adequate musculature for such an operation" speaks against such tactics.[3] Nor are there any cliffs or other highlands in the vicinity of their remains from which these creatures could have launched off.

Enter the aeronautical engineers who next came upon the scene claiming that no creature with a wing-span exceeding forty feet could have been capable of flight regardless of the problem of take-off. "Such dimensions," these engineers asserted, "broke all the rules of flight engineering; a creature that large would have broken its arm bones if it tried to fly."[4]

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[1] *Ibid.*, p. 182 (emphasis as given).
[2] *Ibid* (emphasis as given).
[3] *Ibid.*, pp. 182-183 (emphasis as given).
[4] R. T. Bakker, *The Dinosaur Heresies: New Theories Unlocking the Mystery of the Dinosaurs and Their Extinction* (N. Y., 1986), pp. 290-291.

This resulted in something which until then had been unheard of among paleontologists—they back-tracked by revising their model in order to conform with the laws of aerodynamics. Since the wing bones of the Big Bend pterosaur that had been discovered were not complete, they revised Lawson's computer-estimated wing-span and reconstructed the flyer with slightly shorter wings.

Eventually named *Quetzalcoatlus northropi*, the Big Bend pterosaur's wing-span was finally settled at thirty-six feet[1]—just this side of aerodynamics' allowable stretch. Robert Bakker, however, did not give in. Despite the fact that he could not offer a solution to the problem, he continued to maintain that the pterosaur in question had to have been as big as Lawson had originally calculated and that it flew despite aerodynamic laws.[2]

All of that, however, changed during the September 2005 annual meeting of the British Association for the Advancement of Science in Dublin, Ireland. It was there announced that a sub-species of pterosaurs known as azdarchids from Israel boasted a wing-span that stretched to 14 meters—that is 45.9 feet—close to 10 feet longer than *Quetzalcoatlus*' aerodynamically allowable span.[3]

And that was not yet the widest wing-span that has come to light. A similar creature, the remains of which were discovered in Mexico, has been calculated to have had wings spanning more than 18 meters—that is more than 59 feet.[4]

True, it has to be admitted that these wing-spans were calculated through the use of three-dimensional computer imaging on the basis of small fossil fragments and the size of some footprints.[5]

As of this writing, however, no aerodynamic engineer has clamped down on this newer disclosure despite the fact that the flapping of such wings in our present atmosphere would have been even more difficult, if not impossible, than the flapping of *Quetzalcoatlus*' reduced span. Perhaps that is because paleontologists had smoothed the path to acceptance by explaining that pterosaurs possessed a very strong but light bone structure.

> "Their skeletons [according to David Martill of Portsmouth University] were very lightly constructed and most of their bones were hollow and enclosed an air sac system connected to the lungs. The bone itself was composed of many microscopically thin layers stacked together like a spirally bound plywood tube. Sometimes the bones had cross-sectional shapes that provided added strength, such as D, T and A shapes."[6]

That they could actually tell, from just bits and pieces, that the air sacs were connected in a system to the non-preserved lungs might be stretching it more than just a bit. But let that be for now.

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[1] R. Monastersky, "Pterosaurs," *National Geographic* (May 2001), pp. 95, 105.

[2] R. T. Bakker, *loc. cit.*

[3] R. Sadler, "Dinosaur Big as a Plane Ruled Sky," *scotsman.com* (September 9, 2005).

[4] *Ibid.*

[5] *Ibid.*

[6] *Ibid.*; see also E. Kleeman, "Largest Pterosaurs Uncovered," *Discover* (December 2005), p. 11.

What is of greater interest to this study is that such wing-spans would not have proven detrimental in the primordial milieu we have been theorizing. On the contrary, while it would not have permitted these creatures to flap their wings, the greater atmospheric density Frederic Jueneman and others[1] have proposed in relation to early Earth would have *necessitated* such spans in order to allow them to glide.

WINGS ON THE WIND

Prehistoric insects of the Carboniferous period, which included dragonflies with two-and-a-half-foot wingspans and mayflies as big as canaries, were also believed to have been impossible to fly.[2] As Jeffrey Graham recalls: "I remember seeing models of giant dragonflies as a child and wondering how they could fly."[3] But in the mid 1990s, a solution was offered by Graham and his colleagues who now believe that the entire Carboniferous insect population may have been enabled to fly in an oxygen-rich atmosphere. This hypothesis was proposed by Robert Berner who claimed that "the atmosphere in the Carboniferous was more oxygen rich than at any time before or since—it was 35 percent oxygen...compared with 21 percent today."[4] According to Berner this was due to "the rise of land plants in general and in particular to the vast and verdant swamps that characterized the Carboniferous."[5]

> "All those swamp plants spit oxygen into the atmosphere, and when they died, they escaped the open-air decomposition by bacteria that would have drawn oxygen back out of the atmosphere. Instead they sank into the swamps, ultimately forming the coal deposits that gave the Carboniferous its name."[6]

Never mind, as already noted, that coal could not have formed in this manner and that there is no *direct* evidence of higher atmospheric oxygen levels during the Carboniferous. After all, as many others before and since, Berner's hypothesis is simply based on a computer model. Nevertheless, as Shanti Menon explained, the oxygen-rich atmosphere hypothesized by Berner would have made for "a denser atmosphere that provided more lift and thus made it easier for [Carboniferous insects] to fly."[7]

While this is in keeping with Frederic Jueneman's Pleiongaea,[8] it should be kept in mind that, as Menon was forced to admit, the whole idea is "a hypothesis based on a hypothesis."[9] And yet, a denser past terrestrial envelope had been theorized as early as the mid-19th century by Richard Owen precisely to account for the otherwise impossible flight of what was even

[1] *God Star*, pp. 346, 348, 380, 385; *Flare Star*, p. 331.

[2] S. Menon, "Insects of the Oxygeniferous," *Discover* (September 1995), p. 32.

[3] *Ibid.*

[4] *Ibid.*

[5] *Ibid.*

[6] *Ibid.*

[7] *Ibid.*

[8] F. B. Jueneman, "Pleiongaea: A Myth For All Seasons," *AEON* II:3 (January 1991), pp. 45 ff.

[9] S. Menon, *loc. cit.*

Dragonflies—which, during the Carboniferous period , sprouted wingspans of two and a half feet.

then known of giant pterosaurs.[1] Around 1985, Dale Russell and Parvez Kumar reached the same conclusion.[2]

And then, after all is said and done, can it be definitely said that we know all there is to know about aerodynamics? Never mind *prehistoric* insects—up until the year 2000, science had not yet authorized bees to fly because their anatomical construction, wing structure, and mode of flying contradicted aerodynamic laws. And this, incidentally, applied not only to bees but to insects in general. Thus when a variety of insects were placed in a wind tunnel to analyze their method of flight, it was discovered that their lift was less than half that required to levitate their own body weight, and quite often less than a third. But they flew anyway.

It took Charles Ellington to finally crack the secret behind the biomechanism of insect flight, which turned out to be much more complex than anything aerodynamics had then dreamed of.[3] None of which can however be made to apply to the oversized wingspans sported by pterosaurs.

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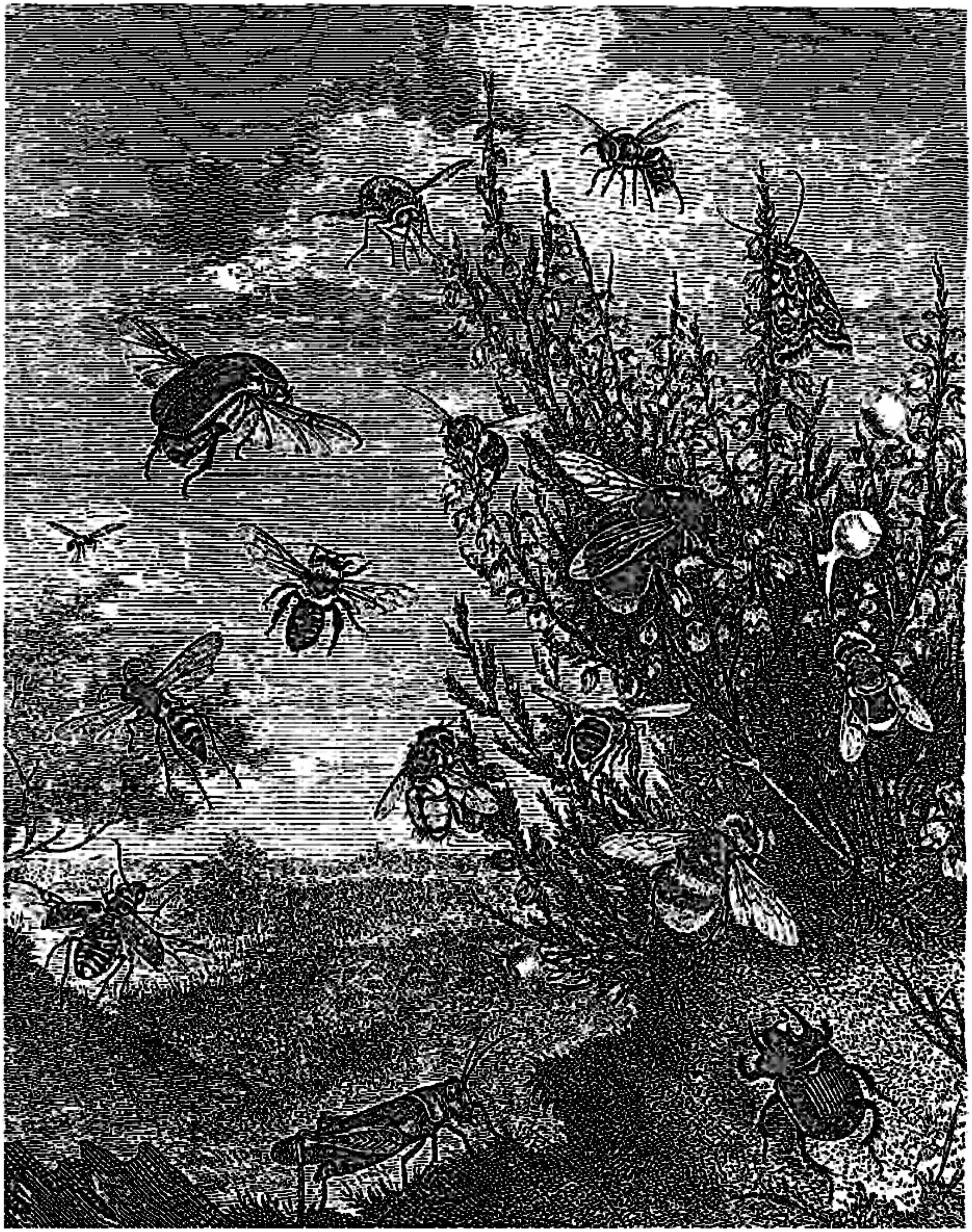
[1] D. Norman, *Dinosaur* (N. Y., 1991), pp. 74, 218.

[2] F. Jueneman, "Pterodactyls in the Mesozoic: A Flap in Time," *AEON* V:2 (April 1998), pp. 21-22.

[3] R. Kunzig, "What's the Buzz? The Physics of...Insect Flight," *Discover* (April 2000), pp. 27-28.



Bees and other insects which aerodynamic laws did not allow to fly until the year 2000.

Giant insects and pterosaurs aside, if there is one thing we can all be certain of concerning dinosaurs, it has to be their size. True—they *did* come in all sizes, and some of them were quite small, with newer discoveries appearing even smaller than earlier-known critters. At Como Bluff, in Wyoming, for instance, Bakker has unearthed a veritable world of diminutive dinosaurs,[1] among which were "pterodactyls the size of sea gulls and swamp-dwelling dinosaurs the size of turkeys."[2] *Compsognathus longipes* measures a "little taller than a chicken and likely weighed less than four kilo grams."[3] Perhaps the tiniest of all is *Hadracodium wui*, discovered in China, whose skull was no bigger than a dime and "weighed no more than a paper clip"[4]—although this might be something of an exaggeration. It is however not quite certain whether this creature was a dinosaur or not. Heralded as the oldest possible ancestor to mammals,[5] it might have filled the gap between the two.

The dinosaurs most people are familiar with, however, are those of gigantic stature. Feduccia belittled the beasts when he alluded to them merely as "*fairly large*, earthbound creatures."[6] Some of them were truly enormous. Among the theropods alone, the three largest were *Tyrannosaurus*, *Albertosaurus*, and *Aublysodon*, the former of which has been estimated to have weighed from 4.5 to 5.7 tons.[7] One that came to light in the late 1980s in Montana was "at least 10 percent bigger than Sue, the controversial South Dakota dinosaur that [until then] was the largest *T. rex* ever uncovered."[8]

Brachiosaurus "was nearly three times as tall as a modern giraffe."[9]
Throughout the years, however, newer dinosaurs started growing ever bigger. Until 1988, for instance, only five specimens of *Archaeopteryx* had been known. A sixth one had lain unrecognized in the private collection of a former mayor of Solenhofen in West Germany. It was eventually recognized for what it was by the director of the Jura-Museum in Eichstätt. This specimen was 10 percent bigger than the one in the British Museum "and fully twice as big as another specimen."[10] But that was nothing compared to what was yet to come.

Consider the giant claw and other bones discovered in January 1996 by Fernando Novas of the Buenos Aires Museum of Natural Sciences. Unearthed in northwestern Patagonia, which has been described as "a dinosaur-fossil hot spot," the claw measured a good 12 inches.[11]

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[1] J. Robbins, "The Real Jurassic Park," *Discover* (March 1991), p. 52.

[2] P. Hoffman, "A Day at the Park," in *ibid.*, p. 4.

[3] H. Pringle, "The Real Deal on Dinos," *Equinox* (December 1995), p. 55.

[4] C. Rist, "Tinysaurus," *Discover* (January 2002 Special Issue), p. 43.

[5] *Ibid.*

[6] A. Feduccia & K. A. Svitil, *op. cit.*, p. 16 (emphasis added).

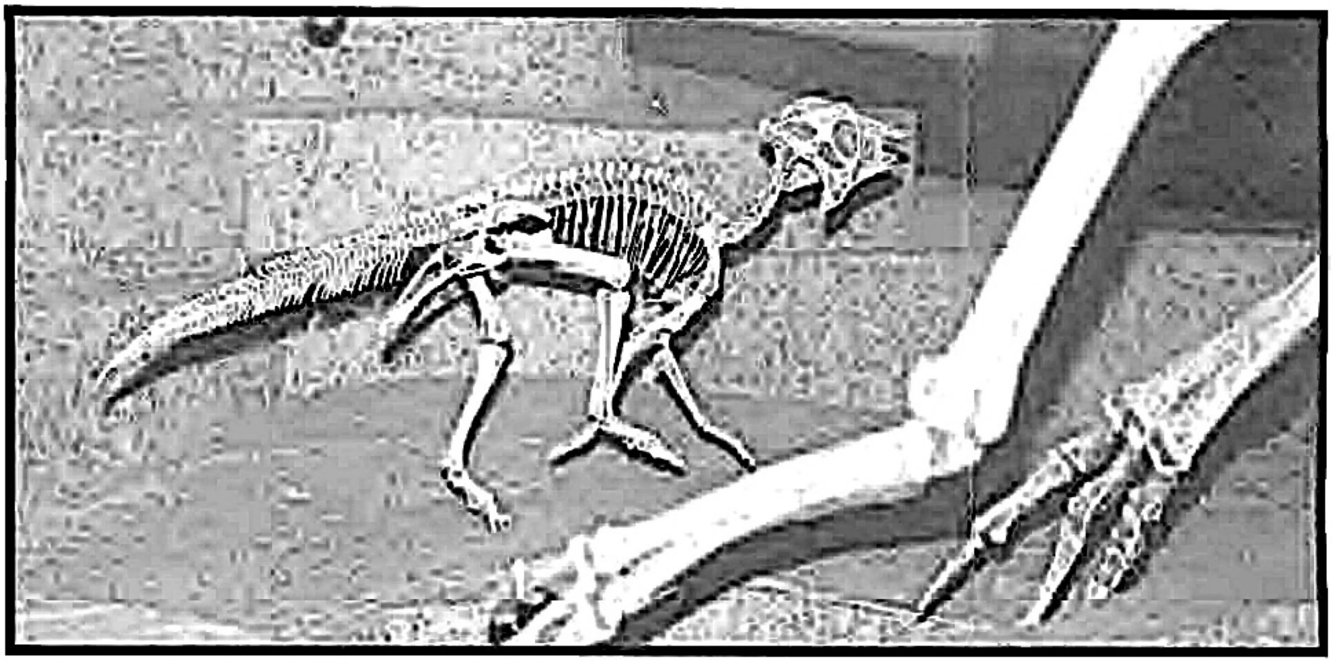
[7] J. D. Archibald, *op. cit.*, p. 110.

[8] E. Dobb, "What Wiped Out the Dinosaurs?" *Discover* (June 2002), p. 39.

[9] H. Pringle, *loc. cit.*

[10] P. Shipman, "Sixth Find is a Feathered Friend," *Discover* (January 1989), p. 63.

[11] S. Menon, "King Claw," *Discover* (April 1998), p. 30.



Diminutive dinosaur.
(Photograph by the author.)

> "Three months later, back in his lab in Buenos Aires, Novas was due for another surprise. He had assumed that the huge claw would be attached to the dinosaur's hand. But after the fossilized bones had been prepared, he saw that the claw belonged on the second digit of the foot. The claw, compressed on either side to give it a knifelike cutting edge and a pointed tip—was strikingly similar to the killing claw on the foot of *velociraptor*, only much bigger. The bone Novas found was nearly a foot long. In a living animal the bone would have been covered with a horn sheath, making it several inches longer...'We are talking about a claw that is 16 inches [claimed Novas]. This is an animal that is huge'."[1]

Named *Megaraptor namunhuaiquii* by Novas, and based on the bones he found together with the claw, the animal's length has been estimated to have been about 26 feet, "making it at least three times the length of *Velociraptor*." However, despite some similarity, the two carnivores are not thought to be closely related. Novas is of the opinion that *Megaraptor* "represents a new lineage of carnivorous dinosaurs that evolved independently in the Southern Hemisphere." Even so, *Megaraptor* is not the biggest dinosaur discovered in Patagonia. Previous to *Megaraptor*, the region had already yielded a "42-foot-long terror" which has been named *Giganotosaurus*, and the 100-ton *Argentinosaurus* which was touted as "the heaviest beast to walk on land."[2] *Megaraptor*'s claw was not even the biggest ever found. A much bigger one, discovered by the dinosaur-hunting family of Doug Wolfe in New Mexico's Zuni Basin, had "3-foot-long claws resembling pitchfork tines."[3]

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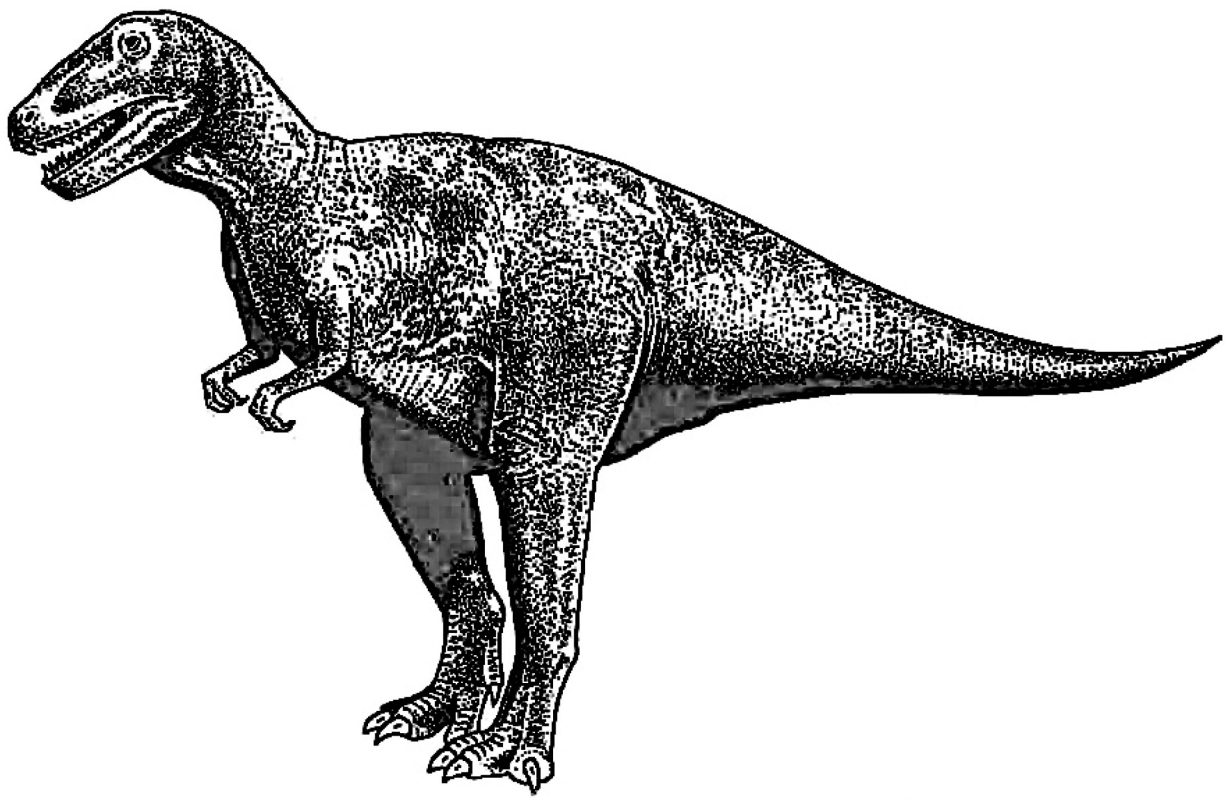
[1] S. Menon, *loc. cit.*

[2] *Ibid.*

[3] H. Pringle, "The Creature from the Zuni Lagoon," *Discover* (August 2001), p. 45.



Albertosaurus—weighing in at 2 tons—belittled by newer discoveries.[1]
(Illustration by Bob Giuliani.)

And then there is *Carcharodontosaurus saharicus* discovered by Paul Sereno in the Sahara. It was a towering shark-toothed creature some 50 feet in length, "larger than any [till then] known specimen of the infamous *Tyrannosaurus rex*." And even this fell short of the 60-foot long sauropod Sereno unearthed in the same region.[2]

Or take the exquisitely preserved embryos "still curled up inside their cantaloupe-sized eggs," discovered among the *thousands* of dinosaur eggs in Argentina. Members of the long-necked plant eaters known as sauropods, "which included the largest animals ever to walk the Earth," the embryos reach as much as a foot in length. In adulthood, these titanosaurs would have attained lengths of 30 to 100 feet.[3]

There is also *Paralititan stromeri*, retrieved by Josh Smith in Egypt's Bahariya Oasis. This titan "would have dwarfed four elephants standing on top of one another." From 80 to 100 feet long, it would have weighed "as much as 150,000 pounds [67 tons]."[4]

Add to that the well-named *Seismosaurus*—"Earthshaker." Its excavated bones indicate a length around 35 meters (115 feet)—or, as some have it, 40 meters (131 feet)[1]—a height of

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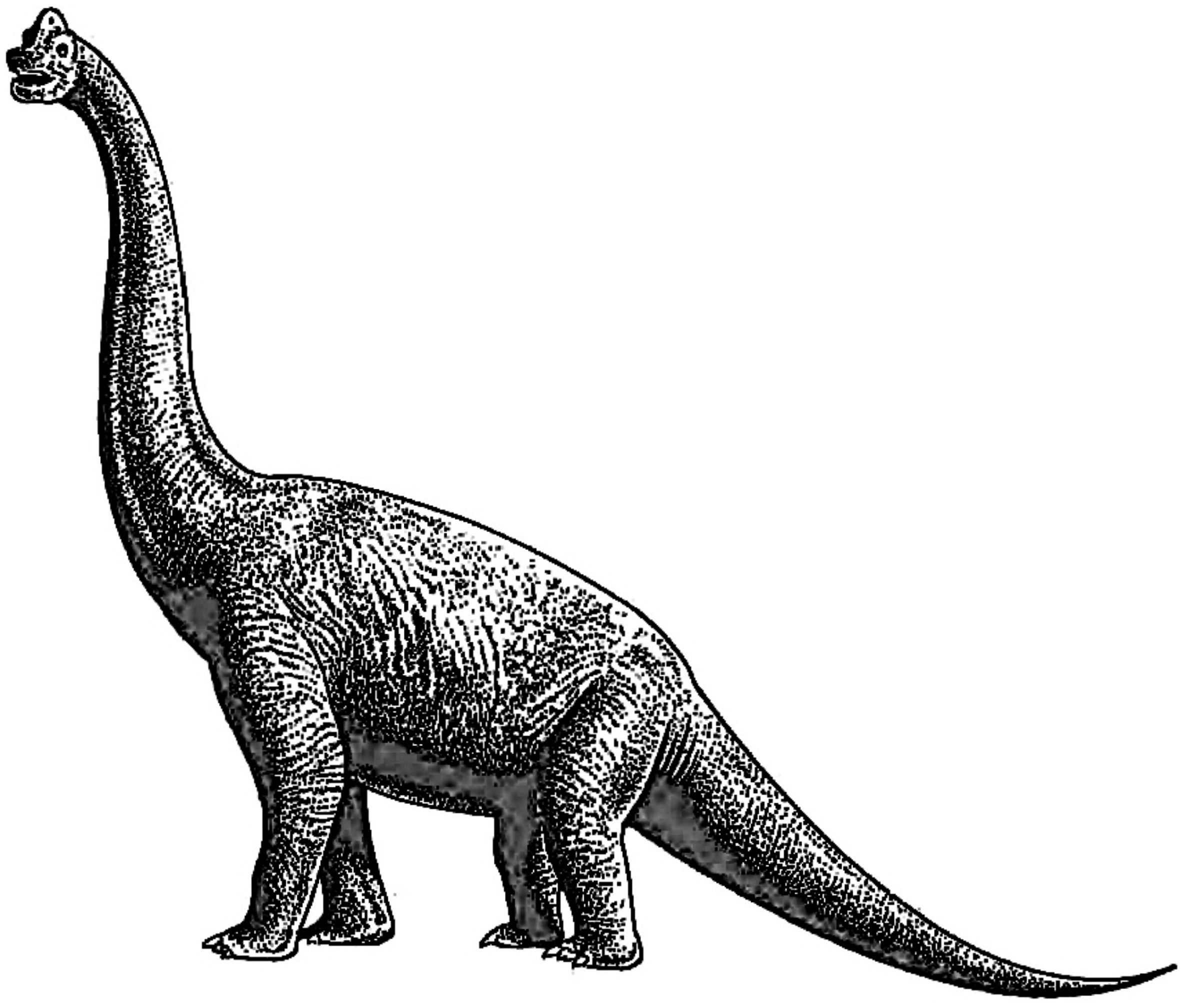
[1] J. D. Archibald, *op. cit.*, p. 112.

[2] M. DiChristina, "The Dinosaur Hunter," *Popular Science* (September 1996), p. 42.

[3] J. Glausiusz, "Secrets of Ancient Dinosaur Eggs," *Discover* (January 2002 Special Issue), p. 12.

[4] C. Rist, "A Giant Among Dinosaurs," in *ibid.*, p. 52.



***Brachiosaurus*—nearly three times as tall as a modern giraffe.**
(Illustration by Bob Giuliani.)

6 meters (19 feet) at the shoulders, and an estimated weight of 80 tons.[2] So, similarly, with *Ultrasaurus*.[3]

And then include the giant from Morocco, named *Breviparopus*, which comes in at 48 meters (157 feet) in length.[4]

In most cases not all the bones of a single individual were recovered. For instance, the first *Seismosaurus* was reconstructed out of eight connected vertebrae from the middle of the tail and a single thigh bone.[5] Also: "Fewer than half the bones of any one juvenile *Barosaurus*

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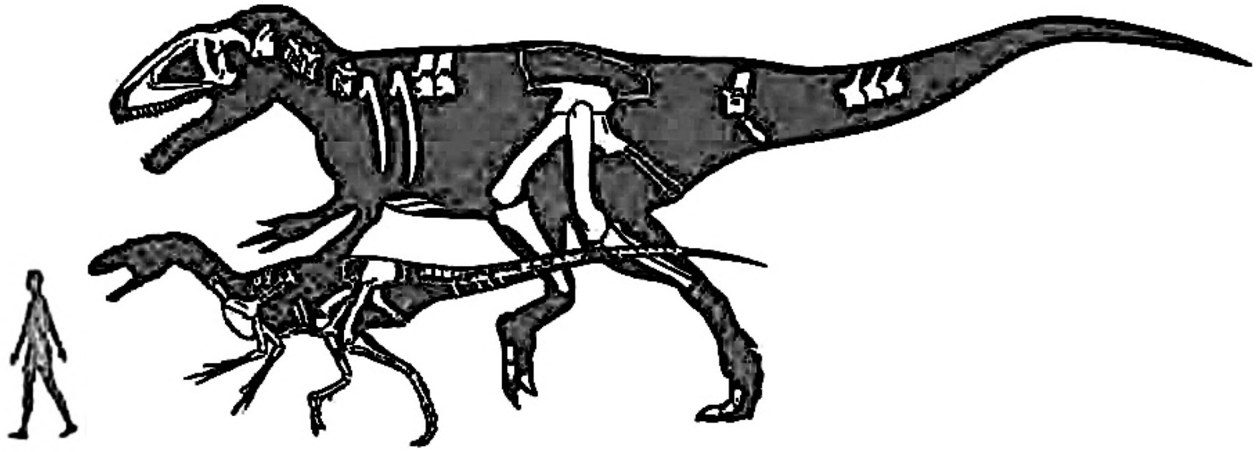
[1] H. Pringle, "The Real Deal on Dinos," *Equinox* (December 1995), p. 55.
[2] T. Holden, "The Sauropod Dilemma," *AEON* II:4 (May 1991), p. 117.
[3] H. Pringle, *loc. cit.*
[4] T. Holden, *loc. cit.*
[5] *Ibid.*



The vicious predator *Deltadromeus* dwarfs a human being, but is itself dwarfed by *Carcharodontosaurus*
(Adapted from an illustration by John Grimwade.)

have ever been excavated," and in order to reconstruct a model of this particular creature, 60 percent of the bones which were missing from the original skeleton had to be sculpted out of plasticene.[1] Nor does this merely apply to new discoveries. In fact: "Only a few complete dinosaurs have ever been found in fossil form with every bone in correct articulation."[2]

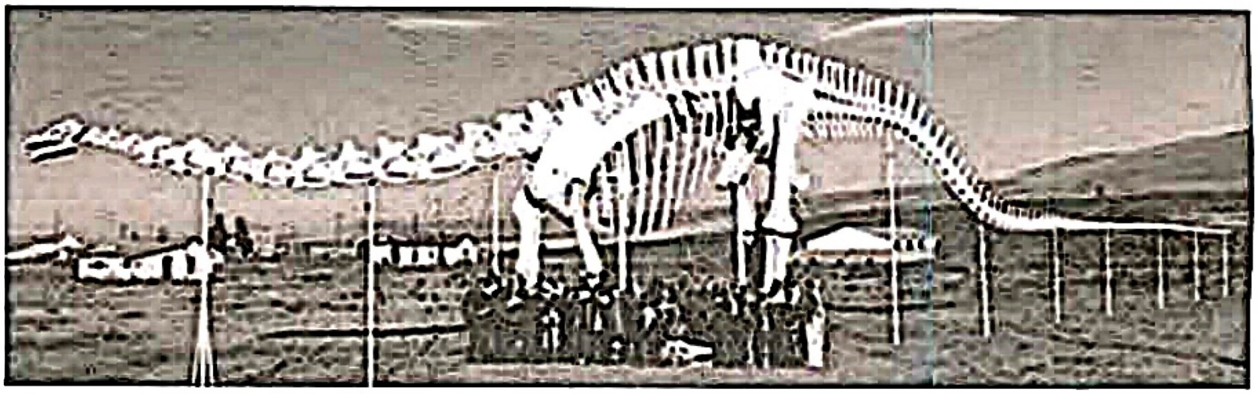
For these and other reasons there were therefore some who began to doubt whether these immense vertebrates had really been quite as big as they were being reconstructed.[3] Given that, in some cases, some slight exaggerations might have entered the picture, it must, however, be conceded that the size of the bones that have been recovered remain mute witnesses to the proportional scale of these truly gigantic beasts.

And they got bigger still. Non-digging techniques, such as geophysical diffraction tomography, has aided in the discovery of a dinosaur which has been estimated to measure between 130 and 200 feet in length.[4]

Colossal size, however, was no guarantee from immunity. "Whatever their size," wrote Mariette DiChristina, "even the largest dinosaurs were not invincible."[5] Speaking of one of Sereno's famous finds, she pointed out that:

> "There are, for instance, marks of terrible injuries on the giant *Carcharodontosaurus* skull. The beast suffered a nasty blow to the side of its cheek. 'It may have got that

[1] I. Cruickshank, "Dino Dazzlers," *Equinox* (December 1995), pp. 43, 45.
[2] *Ibid.*, p. 43.
[3] See here, for example, *New Scientist* (February 13, 1993), p. 15.
[4] T. E. Levy, "From Camels to Computers," *Biblical Archaeology Review* (July/August 1995), p. 64.
[5] M. DiChristina, *op. cit.*, p. 44.



Skeletal reconstruction of *Seismosaurus* compared to a human crowd.
(Photograph courtesy of Seismosaur.com)

while it was preying upon something very large, which it undoubtedly did,' says Sereno. The skull also has a deep tooth puncture above the left nostril. That could have happened during a fight with a rival."[1]

The hazard of ferocious rivals, however, was not the only vulnerability they had to overcome. They also had to surmount the burden of their own weight.

WEIGHT-LIFTING POWER

Even before the megasaurs began to steal the show, palaeontologists had already realized that the brontosaurs, which could have weighed up to 30 tons (about the weight of six modern elephants) with a length of 70 feet,[2] would have had a hell of a time bearing their own weight. For that reason brontosaurs were exiled into swamps through which they were supposed to have waded with their heavy bulk buoyed up by the shallow water. "To undergird their enormous weight," wrote Lincoln Barnett, "[the brontosaurs] had reverted to four legs, which evolved into pillars of monolithic solidity and strength, and sought surcease from the tug of gravity by spending much of their lives wallowing half submerged in shallow lakes and mires."[3] In some depictions, the related *Brachiosaurus* was shown with his long neck, which could reach up to over 18 feet in length, being held straight above the water very much like a living periscope, but acting more like a modern snorkel.[4]

In time, however, as Bakker finally made clear, it became evident that these enormous beasts were little adapted to life in water. Claiming that brontosaurs were plains and forest dwellers, Bakker intensified his reputation as a maverick. Among the evidence he pointed at

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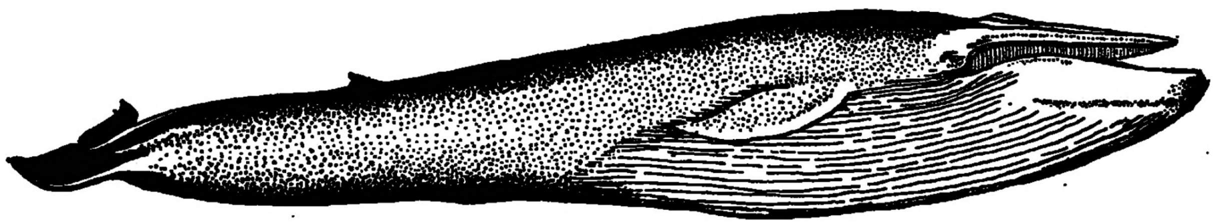
[1] *Ibid.*

[2] L. Barnett, *The World We Live In* (N. Y., 1955), p. 101.

[3] *Ibid.*

[4] See, for instance, the painting of *Brachiosaurus* by Z. Burian in J. Augusta, *Prehistoric Animals* (London, 1967), PL. 26, reproduced in larger format in Z. V. Spinar, *Life Before Man* (London, 1973), pp. 122-123.



***Sibbaldus musculus*, the blue whale, the largest extant animal, can be up to 100 feet long and weigh as much as 70 tons.**

to uphold his bold contention was the severe tooth wear that was obvious in brontosaur jaws which suggest that they fed on coarse terrestrial vegetation rather than on soft water plants. Also, unlike modern hippopotami, to which they had been compared, brontosaurs and other sauropods possessed long legs and deep rib cages very much like present elephants. Moreover, hippopotami legs are relatively weak and flexed at the knees and elbows, whereas those of brontosaurs, again like those of elephants, are pillar-like columns fashioned for transport over land. Besides, brontosaur feet were not adapted to the soft mud which forms the bed of swamps. The hippopotamus has splayed-out toes which enable it to support itself on mushy ground. Brontosaurs, once more like elephants, possess short stumpy toes encased in fleshy pads.[1]

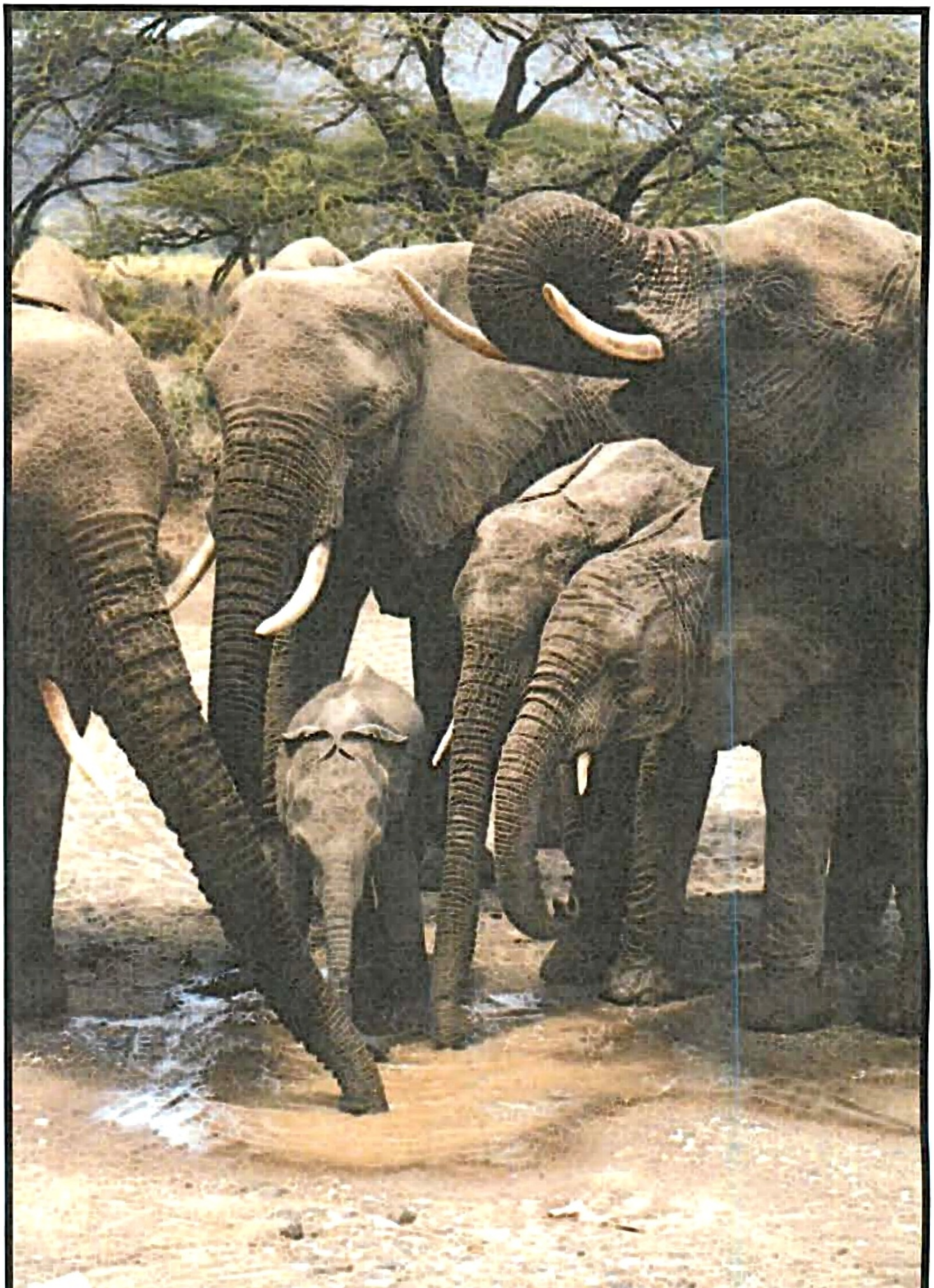
What was however worse was that this exacerbated the problem concerning how a 30-ton beast could have maneuvered freely beneath the burden of its own weight. The largest of all extant animals is *Sibbaldus musculus*, the blue whale, which can be up to 100 feet long and weigh as much as 70 tons. But whales are entirely buoyed up by the water in which they thrive. It is more than doubtful that they could ever bear their own weight on land had they been endowed with legs. On land, the largest extant animal is the elephant. Comparing sauropods to elephants, however, is one thing; comparing their weight is quite another. An elephant can reach up to 11 feet in height and weigh anything between 6 to 8 tons. This is hardly comparable to the 30- ton weight of previously known sauropods, let alone the later discovery of the 80-ton *Seismosaurus* or the 180-ton ultrasaur described by Christopher McGowan.[2] How could such a heavy beast have maneuvered freely enough to cover large areas in its search for fodder or be dexterous enough to fend off predators?

In a study of animal size, Knut Nielson pointed out what is not readily obvious to most laypersons:

> "...the maximum force or stress that can be exerted by any muscle is inherent in the structure of the muscle filament...This force is body-size independent and is the same

[1] A. J. Desmond, *op. cit.*, p. 129.

[2] C. McGowan, *Dinosaurs, Spitfires & Sea Dragons* (Cambridge, Massachusetts, 1991), p. 118.



African elephants, the largest extant animals, weighting from 6 to 8 tons, which is hardly comparable to a 180-ton ultrasaur.
(Photograph by the author.)

for mouse and elephant muscle...In fact, the structure of mouse muscle and elephant muscle is so similar that a microscopist would have difficulty identifying them except for a larger number of mitochondria in the muscles of the smaller animal. This uniformity in maximum force holds not only for higher vertebrates, but also for many other organisms, including at least some, but not all invertebrates."[1]

While Theodore (Ted) Holden's opinions on various topics are too far-fetched to merit serious consideration, the in-depth study he has conducted on megasaurs should be applauded. As he has rightly remarked, "there is no reason to believe that any ancient animal might have simply had 'better' or 'stronger' muscle tissue than we do."[2] To which he added:

"Could it be that a really huge animal such as a sauropod might get far better leverage than we do? Logically, it seems more likely that leverage would favor the SMALLER creature, that beyond a certain point, as creatures get really bulky, the layers of thick muscle in the limbs begin to get in each other's way and bind to some extent."[3]

And:

"...the largest animal which anybody knows to have actually lived any time recently, Jumbo [the elephant], as well as the largest mammoths which were roughly his size, is very close to the theoretical maximum, i.e. he faced nearly the same difficulty just lifting his own weight and walking with it which top athletes face in executing maximum, fully-warmed-up, one shot lifts. It appears that elephants have simply evolved into something like the maximum possible size for any land animal in today's world."[4]

One telling question Holden asked is: "If the sizes of the large dinosaurs were such a winning ticket for creatures which dominated the Earth for tens of millions of years, then why in the tens of millions of years which supposedly intervene between their age and our own time, has nothing else ever again evolved to those sizes?"[5] His conclusion, as well as ours, is that "the ratios obtained for sauropods are clearly impossible for our world."[6]

Weight, however, is not the only problem that sauropods would have had to overcome. Eventually, those who studied sauropods came to the realization that these beasts could not really have held their long necks up straight as had been shown in numerous illustrations and museum exhibits. As was ultimately revealed, with upright necks up to 50 or 60 feet in length,

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[1] K. Nielson, *Scaling: Why is Animal Size so Important* (Cambridge, 1984), p. 163 as quoted by T. Holden, *op. cit.*, p. 114.

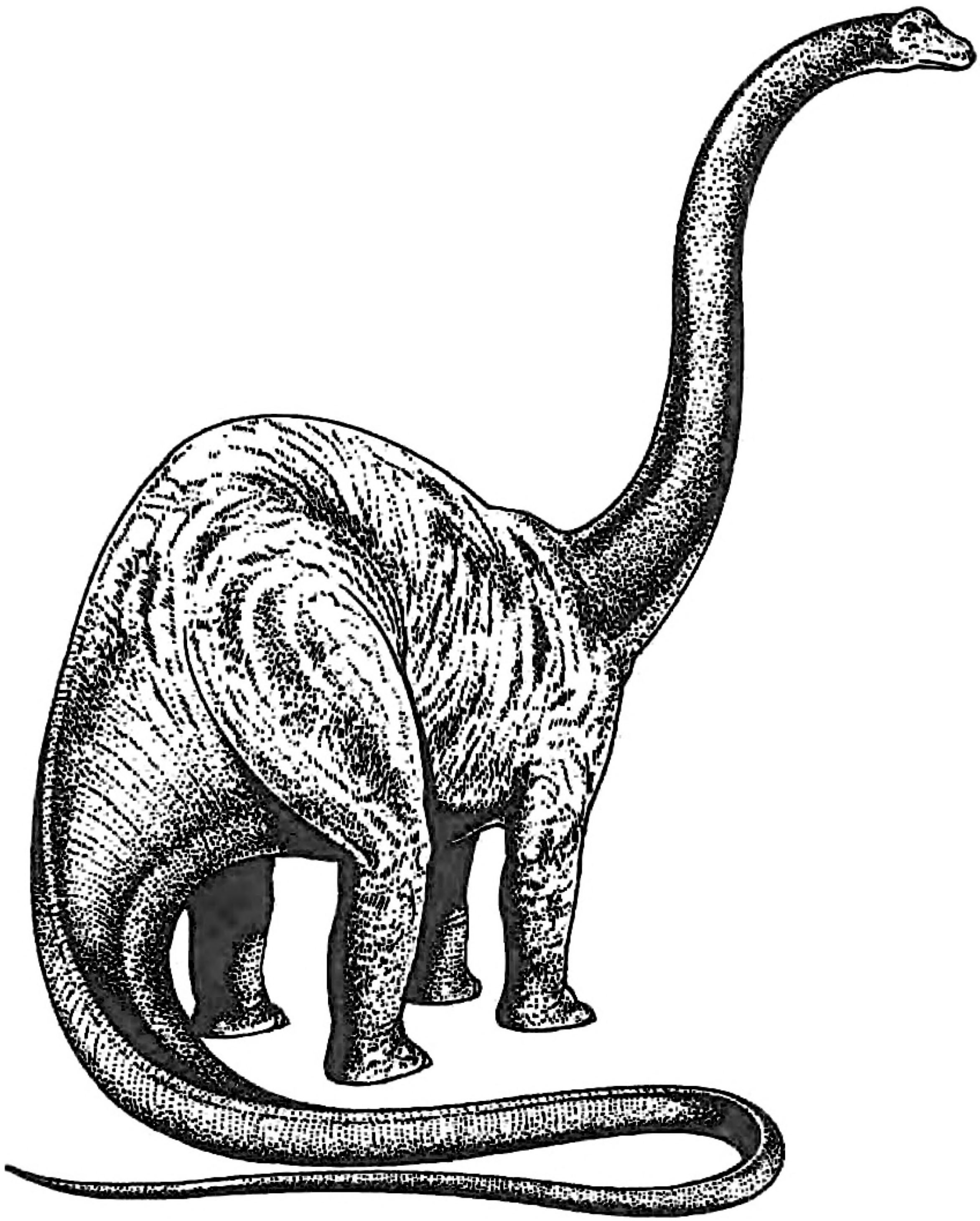
[2] T. Holden, *loc. cit.* (block capitals as given).

[3] *Ibid.*

[4] *Ibid.*, p. 117.

[5] *Idem*, *Dinosaurs, Gravity, and the Changing Scientific Paradigms* (2004), p. 6.

[6] *Idem*, "The Sauropod Dilemma," *AEON* II:4 (May 1991), p. 117.



How could sauropods have been able to pump blood up to their brain without encountering life-threatening difficulty had they held their 50 to 60-foot-long necks in an upright position?
(Illustration by Bob Giuliani.)

the hearts of sauropods would have encountered difficulties in pumping blood up to their elevated brains.[1]

This led to the dismantling of skeletons in various museum exhibits, which skeletons were then reconstructed with sauropod necks stretched out horizontally in front of them (see photograph on page 122). But, as Holden again noted, holding such long necks in a horizontal position in front of them would have entailed an additional burden of weight.

> "Not only is the sauropod's neck several times as heavy as [an] elephant, but the arch [of the sauropod's neck] goes the wrong way! In other words, not only does the sauropod's neck not have the structure which would be needed to support that much weight...but the structure it does have is the *opposite* of what would be required."[2]

All of which led Holden to yet another, and far more reaching, inference—that "*dinosaurs were only able to exist because gravity was attenuated during their age.*"[3]

ATTENUATED GRAVITY

While we distance ourselves from Holden's absurdities in other matters, we do make an exception in this case. Besides, as with various other subjects covered in this work, the rationale behind an Earth with previous attenuated gravity traces to Immanuel Velikovsky. Having arrived at the concept in 1941, Velikovsky put it to paper in comprehensive form in 1943, and again in synopsis in 1946. Although the work was never published, it was distributed to a number of physicists for scientific appraisal and even placed in some libraries.[4] Delineated in a series of twenty five theses, the work is not devoid of misconceptions, but, in the main, Velikovsky did place his finger on a few sore spots. Of the various conclusions which he reached, perhaps the most important was that "Sun, planets, satellites, comets, are [electrically] charged bodies."[5] He did not, however, shrink from going further:

> "A number of facts [he wrote] proved to me that the...planets and their satellites have changed their orbits repeatedly and radically, and *that gravitational attraction or the weight of objects has changed* during human history. I thus recognized the fact that not gravitation, but electric attraction and repulsion and electromagnetic circumduction govern the solar system."[6]

The notion that gravity acceleration would have had to have been lesser than it is today was a conclusion that was also reached by Hans Nieper in 1985, despite the oft-erroneous na-

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[1] H. B. Lillywhite, "Sauropods and Gravity," *National History* (December 1991); P. Dodson, "Lifestyles of the Huge and Famous," in *Ibid.*; see also *Scientific American* (July 1999), p. 16.

[2] T. Holden, *Dinosaurs, Gravity, and the Changing Scientific Paradigms* (2004), p. 32.

[3] *Ibid.*, p. 17 (emphasis added).

[4] I. Velikovsky, *Stargazers and Gravediggers* (N. Y., 1983), p. 165.

[5] *Idem*, "Cosmos Without Gravitation: Attraction, Repulsion, and Electromagnetic Circumduction in the Solar Systrem," (1946), p. 17.

[6] *Ibid.* (emphasis added). p. 22.

ture of his overall theory. He was, even before Holden, astute enough to realize that this "can be confirmed by analysis of the then-existing saurian anatomy..."[1]

A study conducted by R. McNeill Alexander in the late 1980s, however, tended to play the problem down. What Alexander did was implant tiny stress-strain gauges in the bones of elephants, buffalo, ostriches, horses, and other animals, which emitted radio signals while they were standing, running, and/or jumping. He then computed his results through measurements on scale models of various dinosaurs. His conclusion was that the extinct megafauna were not out of line with extant animals. He did, however, encounter difficulties when it came to the horizontally held necks of the giant sauropods, but did not consider the marginality as being fatal.[2] So, similarly, and purely incidentally, Frederic Jueneman who was also thought that the dinosaurs would have been "able to function reasonably well in the same gravity we experience at present."[3]

It was therefore somewhat surprising when anthropologists from the University of The Witwatersrand in Johannesburg were bold enough to venture outside their discipline by suggesting that faunal size might be reliant on differences in gravity, just as those named above had been doing for some years.[4]

SHRINKING HOMO

The fauna with which the anthropologists in Johannesburg mentioned above were concerned had nothing to do with dinosaurs. But what they and others have concluded bears on the subject at hand and, for that reason, we shall step out of time into a different era to see how much of what they now believe can be used to shed light on our topic. The subject of their study was man himself.

Most of us have noted that children are getting taller, and much earlier, than previously. And while this is indicative of an evolutionary increase in human size, the trend cannot be traced back to prehistoric times. On the contrary, it is a modern drift that actually commenced with the nutritional improvement in diets that started to show significant effects in affluent societies in the nineteenth century. Anthropologists, as a whole, have long held that, in actuality, modern man can be considered something of a midget on the human evolutionary stage when compared to his robust forebears.[5]

Comparison of the skeletal remains of our predecessors with those of our era strongly indicates that, sometime between long ago and modern times, mankind has actually shrunk in body size. "The shrinking process," Roger Lewin tells us, "began 200,000 years ago and has continued in fits and starts ever since."[6] Before that time, man's stature and robustness had been on the rise.

[1] H. A. Nieper, *Revolution in Technology, Medicine and Society* (Verlag, Oldenburg, 1985), p. 40.

[2] R. M. Alexander, *The Dynamics of Dinosaurs* (Columbia University, 1989), *in toto.*

[3] F. B. Jueneman, "Gravity and Pterodactyls: More Points to Consider," *AEON* V:6 (August 2000), p. 10.

[4] R. Lewin, "Rise and Fall of Big People," *New Scientist* (April 22, 1995), p. 33.

[5] *Ibid.*, p. 32.

[6] *Ibid.*, p. 30.

> "...many anthropologists would agree that from early in the history of *Homo*, some 2 million years ago, to the appearance of *Homo sapiens*, 300,000 or 400,000 years ago, there was a steady increase in robustness, which then reached a plateau. Here we are talking about immensely strong people with thick skulls and heavily muscled limbs. Early anatomically modern humans, which appeared 200,000 years ago, were significantly less robust than archaic *Homo sapiens*, but much more so than people today."[1]

The fact that archaic *homo* would have had to rely on muscles in pursuit of whatever game he could catch has been used by Robert Foley as a reason behind his steady increase in strength. To this he added the supposition that the males' bigger size would have helped the individual in the competition for the females. Bigger females would also have been prized because of their supposed ability to produce bigger offspring, especially sons, which would eventually help their fathers in hunting game. According to Foley, robustness began to wane "because technological inventions—spears and stone tools—took the place of brute strength." Nor was Foley the only anthropologist to take this, or a similar, stand.[2]

Although *Homo*'s shrinking process began 200,000 years ago, it seems to have "gathered pace at the end of the Pleistocene ice age, 10,000 years ago, but slowed to a halt a few thousand years ago."[3] Fair enough, this "dramatic reduction" in size did not affect all populations, but, as Lewin notes, "where it occurs, the loss of robustness happened principally between 10,000 and 5,000 years ago, and then halted."[4] As has been argued and, to an extent, correctly so, the end of the Ice Age would have "brought many dramatic changes, not least the disappearance of economy-sized larder-fillers such as the mammoth and mastodon." Foley has thus suggested that *Homo* would have fallen back "on two subsistence strategies, both of which encouraged a decline in body size." These two "strategies" would have been agriculture and "a shift to a different kind of social structure."[5]

But, as has also been argued, the above suggestion does not hold the amount of water it was intended to. The nutritional stress brought about by the diminished game at the end of the Ice Age and the introduction of agriculture, notes Lewin, "cannot be the whole story."[6]

> "Agriculture was developed at different times in different parts of the world, and in some places not at all, whereas shrinkage was universal. When Europeans landed in Australia and parts of the Americas, for instance, people were still hunting and gathering—yet they too underwent the same pattern of body shrinkage."[7]

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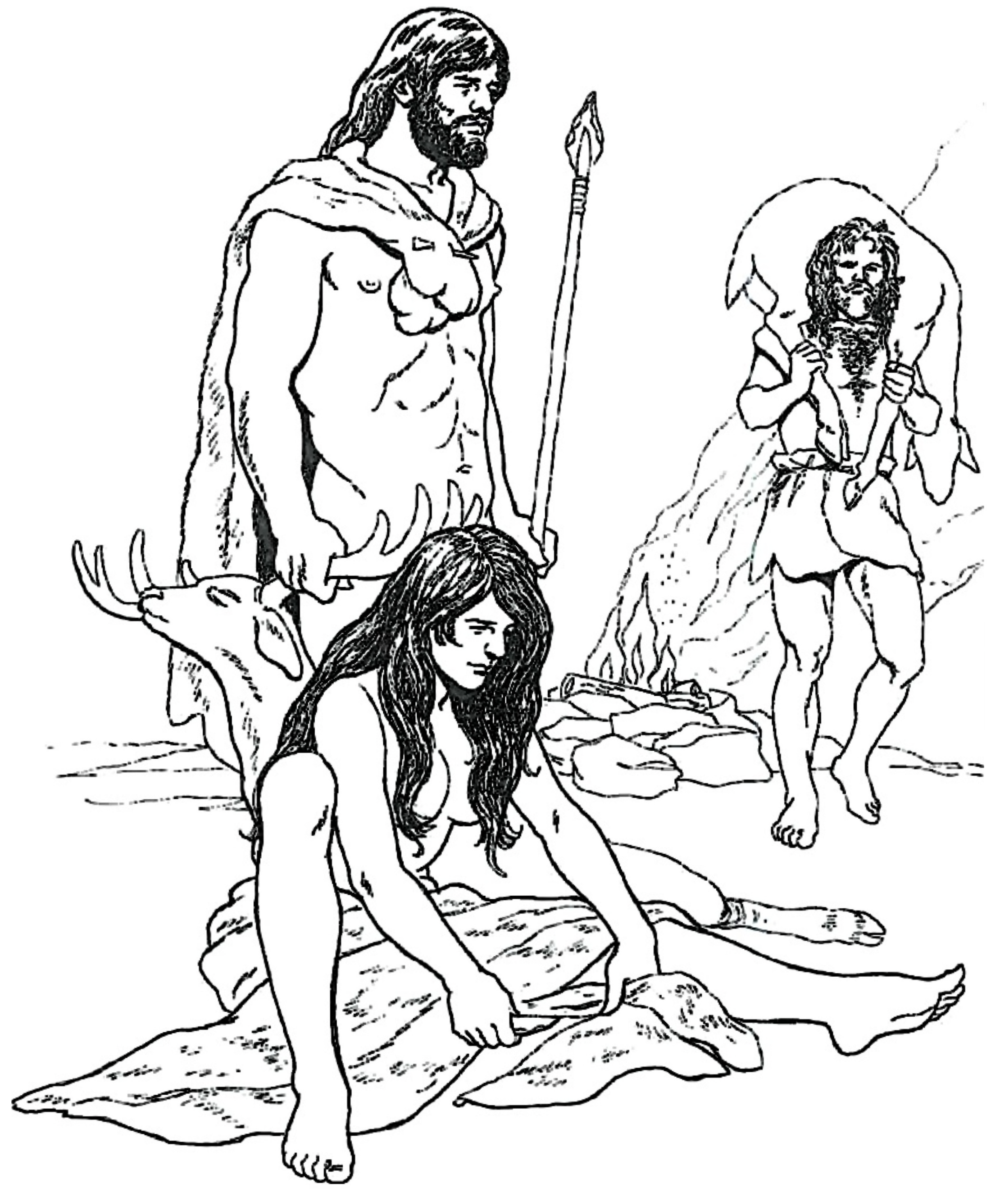
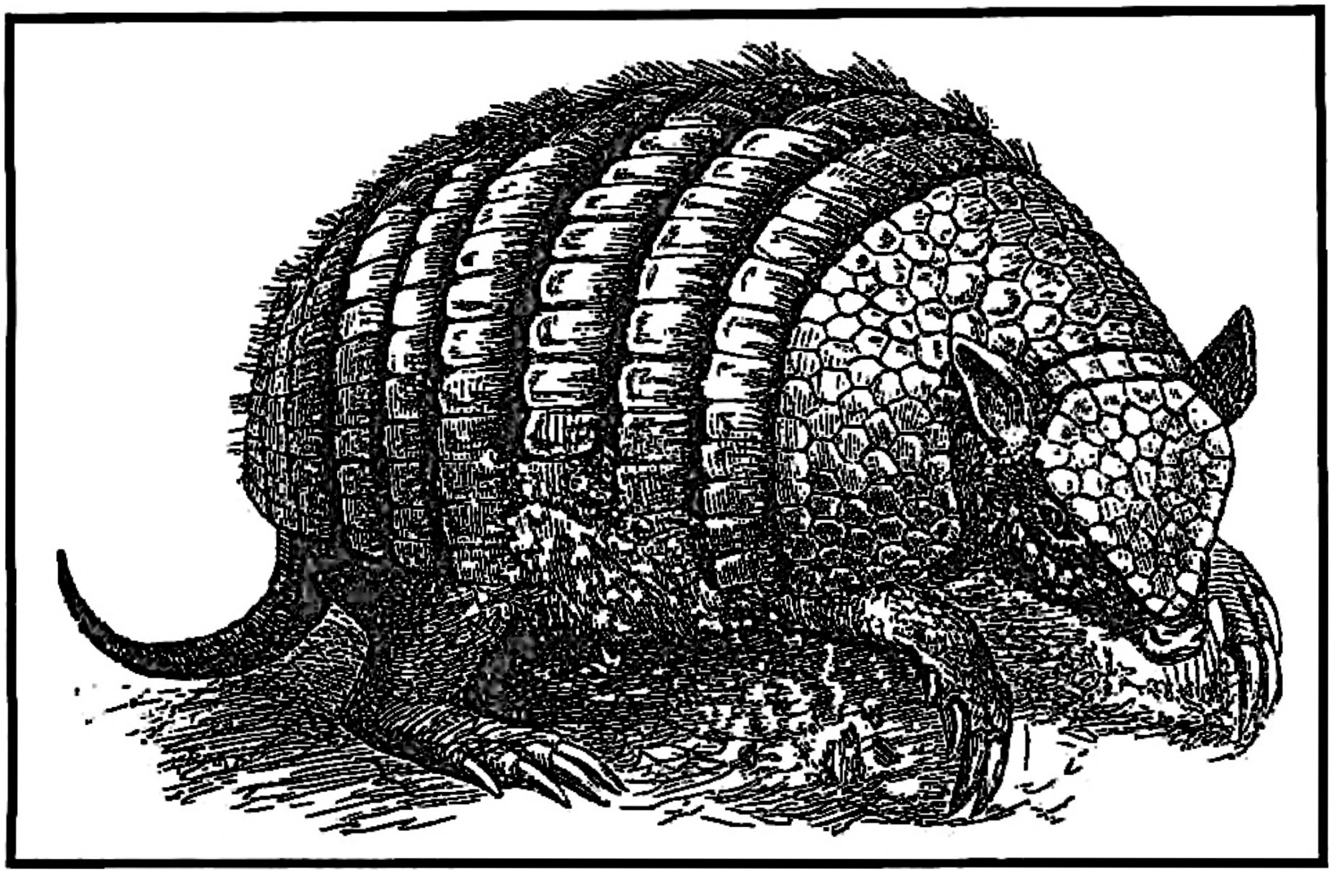
[1] *Ibid.*, p. 31.
[2] *Ibid.*, p. 32.
[3] *Ibid.*, p. 30.
[4] *Ibid.*, pp. 31-32.
[5] *Ibid.*, p. 32.
[6] *Ibid.*
[7] *Ibid.*, p. 33.



Palaeolithic group during the Pleistocene Ice Age.
***Homo sapiens*, during this time, was much more robust in both girth and stature than modern humans.**
(Illustration by Tom Tierney.)



The extant six-banded armadillo—puny relative of the 500-pound, seven-foot-long forebear of 10,000 years ago.

Besides, why would those animals that survived into post-Pleistocene times have also undergone a shrinkage in size? The rhinoceros not only lost its fur, it diminished in size from its former length of about 12 feet and a height of 6 feet.[1] The cave bear "was a good third larger and stronger than its present relative."[2] Or take the elk which "was a strong and heavy beast with imposing antlers which had a span of up to 11 feet,"[3] and compare it to its present representative. And likewise with various other animals. Even the presently modest armadillo pales in comparison to its 500-pound, seven-foot-long forebear when it roamed the American South 10,000 years ago.[4] None of the above theories—nutritional stress, the advent of agriculture, or the change in culture—which attempt to explain man's reduced size can be made to apply to these animals.

Peter Brown then tried to blame the global warming that followed on the heels of the Ice Age, arguing that rising temperatures would have resulted in reduced body mass and thus reduced stature—and this *would* have applied to animals and humans alike. But then, Christopher Russ counter-argued by pointing out that "changes in body form began before the end of

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[1] J. Augusta, *op. cit.*, PL 52

[2] *Ibid.*, PL 60

[3] *Ibid.*, PL 53

[4] "There Were Giants on the Earth in Those Days," *Discover* (April 1998), pp. 14, 18

the ice age, making warming an unlikely explanation." All of which led Lewin to ask: "If cultural causes like technology or population growth, local environmental causes like loss of large game, and global causes like increased temperature, don't explain universal shrinkage, where else can we look for an answer?"[1]

What Lewin considered "the most bizarre explanation" came from Maciej Henneberg and his colleague Graham Louw. According to these two anthropologists, "ultimate body size is influenced by the position of the Earth in its orbit when a person is born." And while some may find that this smacks somewhat of astrology, the fact remains that data collected by Henneberg and Louw actually show that "individuals born between February and July end up shorter and lighter than those born in the rest of the year." Fair enough, we are here talking about a difference of half a kilogram and seven millimeters, but the variance is statistically consistent and therefore significant. The effect cannot be seasonal since it is the same in both terrestrial hemispheres and it is not even restricted to us humans. What Lewin and Louw have suggested, therefore, is that "the effect may be the result of small differences in gravity or electromagnetic radiation as the Earth travels around the Sun."[2] But what would have caused this difference? And would small effects have been adequate to alter gravity enough to allow the massive dinosaurs to thrive despite their weight?

Robin McKie, who was then the science editor of *The Observer*, "mused on the possibility of long-term shifts in Earth's orbit," to account for the shrinkage of the human species. But when this was suggested to Henneberg, he bowed out by refusing to cross disciplinary boundaries, claiming that, as an anthropologist, he has no way to validate McKie's astronomical explanation despite the fact that it did intrigue him.[3]

THE UPS AND DOWNS OF GIGANTISM

Although nothing alive during the Cambrian came anywhere close to the later dinosaurs, there was an increase in size in life forms that, according to Richard Fortey, could have come about "quite swiftly."[4] Faunal gigantism rose again in the Carboniferous period of the Palaeozoic era. As we have already seen, we are here talking about dragonflies "as big as ravens."[5] And, for that matter, so did floral immensity as evidenced by the already mentioned remains of lycopod trees which could reach heights up to 90 feet.[6] Compared to some rare individuals of our modern forest monarchs, which have topped 250 feet,[7] the lycopods might seem quite ordinary. What must be kept in mind, however, is that there had been no growth that tall before the lycopods' sudden appearance. Stature, as Richard Fortey noted, "was the

[1] R. Lewin, *loc. cit.*

[2] *Ibid.*

[3] *Ibid.*

[4] B. Bryson, *A Short History of Nearly Everything* (Canada, 2004), p. 334.

[5] *Ibid.* p. 340.

[6] J. Augusta, *op. cit.*, p. 21.

[7] "Flash," *Discover* (April 2005), p. 11.

most obvious change in vegetation from the early Devonian into the Pennsylvanian part of the Carboniferous period..."[1] Some seeds, so small today, even reached the size of modern dates.[2]

True, as we have previously argued, the tall and spindly nature of lycopods and similar trees was probably the result of straining in order to reach whatever feeble light filtered from the proto-Saturnian sun above to nourish them.[3] Such distention, however, would have been augmented by whatever was responsible for the disproportionate growth of other life forms during the same period. "By the time that the lycopod trees were reaching gigantic proportions," wrote Fortey, "so, too, were some of the insects." Dragonflies grew as big as present seagulls and millipedes were as long as the height of a man. Such magnifications of what today are lowly creatures could not have been engendered by evolutionary pressures in pursuit of more or better light. "Giant trees, giant insects, giant millipedes," wrote Fortey, "there seems to have been an urge to become colossal in the Carboniferous." As he then surmised: "Perhaps there was some special reason to suspend the normal rules."[4] One suggestion that has been offered for this titanic outburst of life is the posited higher oxygen content of the terrestrial atmosphere at the time. Although the "how" or "why" has never exactly been explained, this "rich, heady air" is supposed to have "allowed the arthropods to grow into monsters."[5] Such heady air, however, was not prevalent during the age of dinosaurs. Fortey's suspension of "the normal rules" must therefore be sought elsewhere.

In a 2005 survey of dinosauria, the question of gigantism was again being tackled. Because growth, whether gradual or in spurts, leaves its tell-tale marks on bone, it has been ascertained that dinosaurs grew much faster "than anything on land today."[6]

> "The physiology behind this feat [Carl Zimmer confessed] remains a mystery. Equally puzzling is the fact that dinosaurs managed to reach such big sizes, while land animals that came before and after them never came close. Some researchers have proposed an environmental explanation...But for now that is just speculation."[7]

Or, as Hans-Dieter Sues was honest enough to admit: "We don't have a good answer why dinosaurs were such big animals."[8]

Despite the fact that those land animals that came after the dinosaurs were not as big, the mammals of the following age were giants nonetheless. Among such titans was *Indriocotherium*, the ancestral giant of today's rhinoceros, which reached a height of seventeen feet;[9] the *Megatherium*, with a length stretching over twenty-four feet and a height exceeding that of the

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[1] R. Fortey, *Life: A Natural History of the First Four Billion Years of Life on Earth* (N. Y., 1998), p. 170.
[2] *Ibid.*, p. 171.
[3] *God Star*, pp. 295-297; see also R. Fortey, *op. cit.*, p. 167; and p. 11 of this very work.
[4] R. Fortey, *op. cit.*, pp. 174-175.
[5] *Ibid.*, p. 175.
[6] C. Zimmer, "Dinosaurs," *Discover* (April 2005), p. 34.
[7] *Ibid.*
[8] *Ibid.*
[9] J. Augusta, *op. cit.* PL 48.

largest elephants;[1] to say nothing of the already-mentioned giant elk, the cave bear, and various others. Even so it has to be stated that whatever force, or lack thereof, was responsible for gigantism began to wane following the age of dinosaurs. And yet normalcy, as we understand it today, did not swoop down all of a sudden.

Take primates, for instance, to which evolutionary tree we humans belong. While, through their fossil remains, the earliest apes from the Oligocene epoch of the Tertiary period in the Cenozoic era are considered to have been quite small,[2] a branch which split from the main stem produced *Gigantopithecus*. This evolutionary offshoot ran concurrent with that which produced the hominids, and *Gigantopithecus* himself was contemporary with *Australopithecus*, and perhaps even *Homo erectus*, the ancestor of us all.[3]

To be sure, not much of *Gigantopithecus* has been found—mainly jaws from different localities. But if the giant ape's body was in proportion to its massive jaws, it would have weighed as much as 600 pounds, stretching to nine feet tall when standing erect.[4] Calculated to have appeared some 9 million years ago, it survived until the Middle Pleistocene.[5]

As noted above, early man himself increased in robustness until about 200,000 years ago, at which time his size seems to have leveled off and, perhaps, even decreased to an extent, although he was still more brawny than modern man. Decrease in size then "gathered pace" from around 10,000 years ago at the end of the Pleistocene Ice Age to about 5,000 years ago, at which time his decrease in size came to a halt.

It can then be argued that if gigantism really owes its effect to an aberration of gravity, all of the above would additionally suggest that gravitation on Earth would have varied on and off repeatedly. If, then, terrestrial orbital parameters had anything to do with this, such parameters would themselves have had to vary during Earth's protracted existence.

THE ROCHE LIMIT

It was back in 1979 that Lynn Rose tried to solve the problem of dinosaurian size through *his* version of the Saturn theory.

> "The proximity of Saturn to Earth [he wrote] would have caused a considerable weight reduction, most noticeably at the sub-Saturnian point. (This would be in addition to, or supplementary to, the electrical phenomenon proposed by Velikovsky.) Depending upon the mass and distance of Saturn, it is possible that people, animals, rocks, and so on, at or near the sub-Saturnian point, would have had only a fraction of their comparable weight today...Any significant weight reduction would have had

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[1] *Ibid.*, PL 49.

[2] See here for instance, E. L. Simons, "The Earliest Apes," *Scientific American* (December 1967), pp. 28-35.

[3] E. L. Simons & P. C. Ettel, "Gigantopithecus," *Scientific American* (January 1970), pp. 78, 84.

[4] *Ibid.*, pp. 78, 80.

[5] *Ibid.*, pp. 77 ff.

Megatherium—with a length that would have stretched over twenty-four feet and a height exceeding that of the largest living elephants. (Illustration by Bob Giuliani.)

Left: *Gigantopithecus* jaw. Center: Jaw of modern male mountain gorilla. Right: Jaw of modern man.

dramatic ramifications: we might expect organisms of greater size in both the plant and animal kingdoms (including humans)..."[1]

And Ted Holden followed suit:

"...the existence of the sauropod dinosaurs IMPLIES that the FELT EFFECT of the force of gravity must have been greatly attenuated in the ancient world either by electro-magnetic forces which are no longer in evidence, or by gravitational attraction from some other cosmic body (*such as another, necessarily smaller and dimmer, star which we might have been more closely orbiting at that time*), or by some combination of the two."[2]

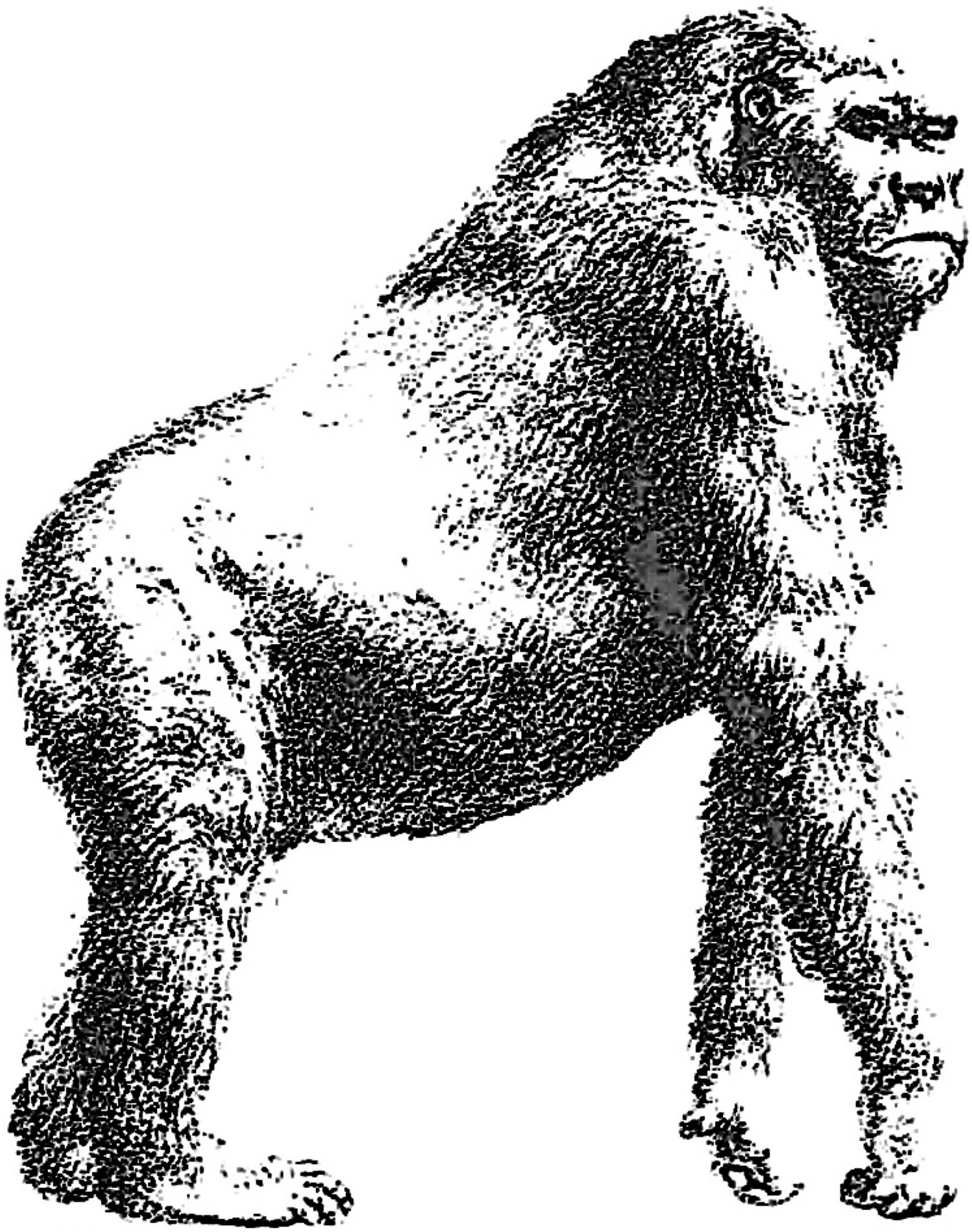
That Holden had proto-Saturn in mind as that "other cosmic body" is indicated by his additional statement that "Immanuel Velikovsky and David Talbott have a plausible explanation for all this," since Talbott's "plausible explanation" refers to the proto-Saturnian theory.[3]

Both Rose and Holden's notion was based on the dictum that any two bodies in the universe attract each other in proportion to the product of their masses. Needless to say, in our own hypothesis, orbital parameters would have had nothing to do with the problem at hand for the simple reason that, while still outside our present Sun's influence, Earth would not have been in orbit around anything, least of all around proto-Saturn beneath which it had been

[1] L. E. Rose, "Variations on a Theme of Philolaos," *KRONOS* (Fall 1979), p. 33.

[2] T. Holden, see reference #104, p. 117 (block letters as given, emphasis in italics added).

[3] See also, *idem*, "Giants in the Earth," *The Velikovskian* I:4 (1993), pp. 7, 17.



Gigantopithecus—calculated to have weighed 600 pounds, stretching to 9 feet tall when standing erect.

permanently suspended, sharing its same axis of rotation.[1] This, however, would not have affected the product of proto-Saturn and Earth's masses, and gravitational attraction, according to theory, should still have been reliant on the proportion to this product. The problem here is that, *according to theory*, the required attenuation of gravity on Earth would have placed our world so close to proto-Saturn that it would have been shattered out of existence. This is because, according to the theory of Roche limit, a celestial body can stand the tidal pull of another only if it remains at a distance 2.44 times the radius of the larger body. Without going into detail, Earth would have had to have been closer than 2.44 times the radius of proto-Saturn for gravity to have allowed the megasaurs to thrive. To his credit, Holden ended up admitting this when it was finally pointed out to him.[2] And yet, perhaps, he should not have been too hasty.

Misunderstandings about what the Roche limit really is even trapped Isaac Asimov.[3] Very much like Holden, Asimov, too, was honest enough to admit his error when this was brought to his attention.[4]

James Mc Canney, too, was trapped when he used the example of comets passing unscathed through the solar Roche limit in their traverse around the Sun as evidence that cometary bodies could not be composed of ice.[5] As it was later established, solid bodies passing through the Roche limit of others do not spend enough time within that limit to be disrupted, whether composed of ice or more solid material.[6]

(And yet, the fragmentation of Comet Shoemaker-Levy 9 in July of 1992, which plowed into Jupiter a year later, has been blamed by Brian Marsden on the comet's passage through Jupiter's Roche limit.[7] As I usually say, go figure.)

In the meantime, four of Neptune's inner satellites are presently orbiting within the Roche limit of their presiding planet. This seems to have led to a new interpretation of the Roche limit which, by the year 2000, was redefined as that area surrounding a planet within which no satellites *can form*.[8] As Curtis Rist spelled it out:

> "All planets have an area called the Roche limit in which the gravitational pull is so strong that material can't form into a satellite. Any satellite in the Roche limit must have either been captured or, more likely, dragged there by tidal forces on the planet's surface. Neptune has four satellites in the Roche limit—the only ones in the entire solar system."[9]

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[1] *God Star*, pp. 204 ff., 220 ff., 259-260, 405 ff.; *Flare Star*, pp. 139-146.

[2] T. Holden, *Dinosaurs, Gravity, and Changing Scientific Paradigms* (2004), pp. 49-50.

[3] I. Asimov, *Of Time and Space and Other Things* (N. Y., 1968), p. 96.

[4] *Idem*, "More on Mercury's Satellite," *Physics Today* (November 1976), p. 92.

[5] See here J. M. Mc Canney, "The Nature and Origin of Comets and the Evolution of Celestial Bodies," Part I, *KRONOS* IX:1 (Fall 1983), p. 21.

[6] Mizuno & Boss, *ICARUS* 63 (1985), pp. 109-133.

[7] J. S. Lewis, *Rain of Iron and Ice* (N. Y., 1996), pp. 146-147.

[8] C. Rist, "Neptune's Strange Satellites," *Discover* (September 2000), p. 59.

[9] *Ibid.*

Whether these four Neptunian satellites were formed around the planet, captured or dragged there—and what is the difference between their having been captured or dragged?—the fact remains that they presently reside within their planet's Roche limit without being disrupted.

What is usually glossed over in most literature, however, is that the Roche limit was *originally* calculated for a *fluid* body. As J. J. Condon, in correcting Asimov, noted, "a solid moon within the Roche limit could be held together by the cohesive strength of the material composing it."[1] There is, therefore, nothing against Earth having existed within proto-Saturn's Roche limit. It would not have been torn apart as Holden's critics have for long maintained.

Would this, then, have been responsible for Earth's past attenuated gravity? Apart from the fact that I am *not* advocating that Earth did indeed reside within proto-Saturn's Roche limit, it is doubtful that such proximity would have alleviated Earth's gravity enough to allow the megasaurs to thrive beneath their burden of weight. As Wayne Throop indicated to Holden, this is because the proximity theory would have required Earth's tidal pull from proto-Saturn to have been about 0.7g when, even within the Roche limit, Earth could at best have suffered a tidal pull of only 0.14g.[2] Although, as per the above, it cannot really be ascertained that this would have been "many more times than enough to destroy the earth," as Throop claimed,[3] it would have brought Earth much closer to proto-Saturn than can be deduced from both the mytho-historical record and Earth sciences. Earth's proximity to proto-Saturn might have *aided* whatever force, or lack thereof, in attenuating terrestrial gravity. But it cannot be the entire story. Keep in mind also that Earth's proximity to proto-Saturn could not have been responsible for the fluctuation of terrestrial gravity through the ages which the evidence presented above calls for—unless Earth's distance from its primeval primary had also varied. And while this, too, might have transpired, it still would not have been enough on its own to account for the problem at hand. What other evidence, then, can we call to arms?

[1] J. J. Condon, "More on Mercury's Satellite," *Physics Today* (November 1976), p. 92; see also C. J. Ransom, "On Mercury Without a Moon," *KRONOS* II:3 (February 1977), pp. 81-83.

[2] W. Throop, as quoted by T. Holden, *loc. cit.*

[3] *Ibid.*, p. 50.

Chapter 6

Mass and Gravity

THE SHRINKING EARTH

Gravity is related to mass so that any two bodies in the Universe attract each other in proportion to the product of their masses. So, likewise, any body resting on the surface of Earth is attracted to the same Earth by a force that is proportional to its mass. Local terrestrial gravitational anomalies, however, are directly related to local density variations associated with local geological features. A change in density in a given amount of matter, however, does not entail a change in mass. Whether a given amount of matter is in gaseous, liquid, or solid form, its mass remains the same. The most obvious way in which the mass of a given amount of matter can change is by the addition to, or subtraction of matter from, the original given amount. But while that might not be the only means, we must also ask: In view of what we discussed in our last chapter, could Earth have been of a different mass, resulting in a different gravitational attraction, in its past ages?

In the early 1800s, the process of mountain building was ascribed by Elie de Beaumont to the wrinkling of Earth's crust in response to the cooling, and thus shrinking, of the terrestrial globe.[1] In other words, primordial Earth was believed to have encompassed a greater volume, but not necessarily a greater density, than it does at present.

But, as Beno Gutenberg demonstrated in 1951, "the cooling of the earth is less than it had been originally believed."[2] Worse than that, the theory was based on the previous view that Earth had come into being as a molten sphere. That particular hypothesis was subsequently dethroned since it is has now been ascertained by academia that Earth was never molten, but that it was gradually built up through the slow accretion of solid particles.[3] Not only that, but, with the advent of plate tectonics, the birth of mountains became understood as the wrinkling of Earth's crust due to the drifting of continental lands and the subduction of ocean beds beneath them.

Some forty years later, however, the earlier theory was revived by R. A. Lyttleton and Hermann Bondi, both of whom had little respect for tectonic plate theory. Their better judgement steered them clear of returning to the molten Earth hypothesis since, according to them, Earth developed its internal heat through radioactivity.[4]

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[1] P. J. Bowler, *Evolution: The History of an Idea* (University of California, 1989), pp. 120-121; A Hallam, *Great Geological Controversies* (Oxford University, 1989), p. 40.

[2] B. Gutenberg, *Internal Constitution of the Earth* (N. Y., 1951), p. 192.

[3] See here S. Kwok, "Mining for Cosmic Coal," *Astronomy* (June 2002), p. 46.

[4] R. A. Lyttleton & H. Bondi, "How Plate Tectonics May Appear to a Physicist," *Journal of the British Astronomical Association*, 102, 4 (1992), p. 194.

"...a phase-change interpretation of the core region of the Earth, based as it is on the lifetimes of radioactive elements, offers a mechanism with a halflife of 4000 million years that is still active today. Radioactivity in the interior of the Earth, *initially solid and cool throughout*, leads after about 1000 million years to the *sudden* so-called Ramsey collapse, which in turn leads to the onset of a phase change to a liquid metallic core..."[1]

Under this theory, the liquefaction of the terrestrial core would have caused Earth's external layers to collapse. According to Lyttleton and Bondi, this collapse was not the result of a gradual weakening of Earth's external layers, but a sudden catastrophic event—one that took place in a matter of hours.[2]

"A whole series of models may be calculated from the time of the Ramsey collapse, *which has been estimated to have taken place 3000 million years ago*, to the present time. Calculations show that the radius of the Earth would have diminished by almost exactly 300 km. Here we have a straightforward cause of mountain-building that has affected the Earth repeatedly since the time of the Ramsey collapse."[3]

A contracting Earth would mean a compression of terrestrial matter resulting in a greater density. But, as noted above, this would not mean that it would have resulted in an increase in mass. In other words, had Earth been less dense in the past, it would not have hosted a lesser gravity. Besides, the suddenness with which Lyttleton and Bondi saddle their catastrophic event will not get us out of our present conundrum since we are seeking a series of protracting episodes to account for the vagaries inherent in the periodic rise and fall of gigantism. Worse still is the three billion years they advocate for their single catastrophic event since this would have been much too early for the dinosaurs.[4]

THE EXPANDING EARTH

The contracting Earth theory does not seem to have much evidence in its favor. Even the supposed mountain building through the wrinkling of Earth's crust due to shrinkage fails to conform to what we see at the edge of continents. True, Lyttleton and Bondi are not the only authorities who have been finding fault with plate tectonics.[5] But, despite the problems which encumber the theory—and what theory is entirely devoid of problems?—the central tenet of plate tectonics continues to hold. One look at a topographical map of the world will immediately show that a chain of mountain ranges stretches along the entire *western* coast of the

[1] *Ibid.* (emphasis added).

[2] See here R. A. Lyttleton as reported in "Mountains Come From Earth Shrinkage," *New Scientist* (October 11, 1979), p. 110.

[3] *Ibid.* (emphasis added).

[4] For more re contracting Earth see P. S. Wesson, "The Implications for Geophysics of Modern Cosmologies in which *G* is Variable," *The Quarterly Journal of the Royal Astronomical Society* (March 1973), pp. 15, 19, 32; re contracting planets in general, *ibid.*, p. 28

[5] See for instance D. Pratt, "Plate Tectonics: A Paradigm Under Threat," *Journal of Scientific Exploration* 14: 3 (2000), pp. 307 ff.

American continent, while a chain of mountains stretches along the entire *eastern* coast of Africa. This is not indicative of Earth shrinkage, but, if anything, of Earth expansion, where the mountains in question *could* be seen as wrinkles in Earth's crust due to the drifting apart of the continents. Add this to the long-recognized close-fitting shapes of the opposing coasts of these two continental masses, and their drifting apart must be said to fit the bill. Granted—the theory of plate tectonics does not claim that these mountain ranges were raised by the continental drift *per se*. The uplift of coastal areas is now believed to be caused by the subduction of oceanic plates beneath the continental ones. In mid-continental areas, mountain ranges such as the Alps and Himalayas—which tend to stretch east to west rather than north to south as in coastal regions—are believed to have been raised by the collision of separate plates. To be sure, continental drift through plate tectonics is not generally believed to be due to an expanding Earth. On the other hand there are those who *do* so claim.

Although we do not subscribe to Alfred de Grazia's version of these hoary events, it should be noted that his scenario, derived in collaboration with Earl Milton, calls for just such an Earth expansion.

> "The circumference of the globe was less then [he informed his readers]. The ocean basins were absent. Mountains were absent as well."[1]

And:

> "Expansion of the globe occurred as a result of rotational slow-down...Loss of electrical charge may also have decreased the density of the Earth."[2]

The major event that led to this expansion, according to de Grazia, was the parturition of the Moon from Earth,[3] a theory which, in slightly different guise, has also been proffered by mainstream astronomers, and with which this work does not agree. Besides, in keeping with Milton and de Grazia's theory, Earth would have expanded through a loss of mass—that of the Moon—to say nothing of a loss in density. And that would then result in a decrease of gravitational attraction which, according to these two theorists' time element, would be the opposite to what we are seeking.

The notion of Earth expansion, on the other hand, is not new. Expansion of the terrestrial globe was hypothesized as early as 1859 by Alfred Wilks Drayson in England,[4] and again in 1899 by I. O. Yarkovski in Russia.[5] There were various others—mainly, but not solely, in Russia—who followed Yarkovski's lead.[6]

The dean of Earth expansionists, however, has to be S. Warren Carey, who has been pushing his theory since the 1970s once he became dissatisfied with plate tectonics in the 1950s.

[1] A. de Grazia, *Chaos and Creation* (Princeton, 1981), p. 100.

[2] *Ibid.*, p. 154.

[3] *Ibid.*, pp. 139 ff.; see also *idem*, *The Disastrous Love Affair of Moon and Mars* (Princeton, 1982), *in toto*.

[4] A. W. Drayson, *The Earth We Inhabit, It's Past, Present, and Future* (London, 1859).

[5] I. O. Yarkovski, *Universal Gravitation as a Consequence of Formation of Substance Within Celestial Bodies* (in Russian—Moscow 1899).

[6] S. W. Carey, *Theories of the Earth and Universe* (Stanford, California, 1988), pp. 137 ff.

Not only did Carey push for an increase in Earth's volume, but also its mass,[1] as so did others besides him.[2] And yet he did not entirely abandon continental drift. Following the trail blazed in the former USSR by Vladimir Beloussov, he came to the conclusion that orogenesis—mountain building—was a gravity-driven upwelling process "that did not imply crustal shortening and could even involve some crustal extension."[3] Together with other European authorities, he came to believe that "the dispersion of the continents described by Wegener could equally be explained by Earth expansion."[4] He could thus accept that ocean floors were spreading, but could not accept that oceanic plates subducted beneath continental ones.[5] He thus referred to this facet of plate tectonics as "the subduction myth."[6] From his point of view this is understandable since spreading ocean floors fit well within the theory of an expanding Earth, but if ocean plates are truly diving beneath the continents, such subduction would tend to neutralize Earth's expansion.

How then, according to Carey, were mountain ranges formed? His claim is that orogenic zones would have been created "where extension is concentrated, not only in the crust, but far down in the mantle." Thus, although the surface at these zones at first subsides, the motion in their orogenic roots remains upward at all stages.[7] But why would this be so?

Here is where Carey deferred to Beloussov's belief concerning the gravity-driven upwelling process of mountain building. "Gravity is far and away the ruling force in the earth," he wrote, and all tectonic movements are driven by this force to restore its own equilibrium where it might have been disturbed by various geological processes.[8] The underlying material then pierces through the overlying rock strata.[9] Carey goes into some very detailed explanations concerning the folding of this uplifted material,[10] and while he seems to have made his case, objections can still be raised in relation to the manner in which continental coastal ranges would have been formed.

Carey does not believe that Earth expansion was uniform through the ages. In fact he is of the opinion that Earth expansion gained momentum through time,[11] and that "the most rapid expansion has been in the most recent time..."[12] Moreover, this continuing rate of expansion, according to him, will yet turn our planet into a gas giant.

> "...the expansion of the earth was real from the start but increased very slowly for the first 37 hundred million years of known geological time, and only 100 million years

[1] *Ibid.*, p. xi.
[2] *Ibid.*, pp. 140, 142.
[3] *Ibid.*, p. 128.
[4] *Ibid.*
[5] *Ibid.*, pp. 170, 301.
[6] *Ibid.*, p. 128.
[7] *Ibid.*, p. 205.
[8] *Ibid.*
[9] *Ibid.*, pp. 225 ff.
[10] *Ibid.*, pp. 217 ff.
[11] *Ibid.*, p. 200.
[12] *Ibid.*, p. 191; see also pp. 325 ff..

Pangaea
The continental configuration prior to drift and/or expansion.
But can such a fit be achieved on the present size of Earth without undue distortion?

ago it was still only 60 percent of its present size. Then a threshold was reached and expansion since has been very rapid; if this continues, Earth would progress rapidly to a state more like Neptune and join the family of great planets."[1]

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[1] *Ibid.*, p. 200. NOTE: For more on Earth expansion, see P. S. Wesson, *op. cit.*, pp. 13 ff., 21-22, 32, 35, 37, 39-40, 42, 46, but see also pp.41 ff. for arguments contra Carey's particular model.

We will leave it for others and the future to decide how many facets of Carey's particular theory—and there are many—can be validated. It must however be stated that there are a few major points in his favor. One of these concerns the area that must have been covered by the bunched-up continents in the consolidated land mass that we now know as Pangaea. As he had realized by 1956, Pangaea cannot be reassembled on the present-sized Earth without unacceptable anomalies.[1] The supercontinent can only be fitted properly on an Earth that would have been about half its present size. This has been abetted by the success of various globe makers in producing terrestrial spheres "of little more than half" Earth's present diameter which were entirely covered with the fitted continents, minus the oceans, without any reduction in the land's surface areas.[2]

Another point in Carey's favor concerns the *continued* expansion of planet Earth. One of Ted Holden's objections to an expanding Earth was that Earth does not appear to be expanding at present.[3] Results from experiments conducted by NASA, however, have shown that the distance from Europe to North America is increasing by 1.5 ± 0.5 cm per year; that between North America and Hawaii is increasing by 4 ± 1 cm per year; between Hawaii and South America by 5 ± 3 cm per year; between South America and Australia by 6 ± 3 cm per year; and between Australia and Hawaii by 7 ± 1 cm per year.[4] "These results support Earth expansion," claims Carey, "but not the plate-tectonic theory, which is denied by the radius increase implicit in the data."[5]

The measurements shown above are those of chords—that is through Earth's crust—not surface distances. From these W. D. Parkinson could calculate that, "during the period of their measurements, the radius of the earth has been increasing at 2.8 ± 0.8 cm per year."[6] This might appear inconsequential to the lay-person, but when projected over geological time it becomes quite significant.

As Carey himself pointed out, however, one great objection that has been raised against the expanding Earth theory is that the gravity acceleration on the terrestrial surface would have been four times what it now is had Earth in the past possessed half the diameter it does at present. This would mean that everything on Earth would have been four times as heavy.[7] To us, this would have been exactly the opposite to what we are seeking and, for that reason, a shrinking Earth would more readily fill the bill. One way out of this is to assume that Earth has actually increased *in mass*, first proposed by Yarkovski in 1889 and, since then, adhered to and developed by others.[8] This is the conclusion that Carey ended up adopting,[9] and it is

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[1] *Ibid.* (i.e., S. W. Carey), p. 143.

[2] *Ibid.*, pp. 139-140, 266.

[3] T. Holden, *Dinosaurs, Gravity, and Changing Scientific Paradigms* (2004), p. 49.

[4] S. W. Carey, *op. cit.*, p. 168.

[5] *Ibid.*, p. 169.

[6] *Ibid.*, pp. 169-170.

[7] *Ibid.*, p. 190.

[8] *Ibid.*, p. 327; but see also P. S. Wesson, *op. cit.*, p. 28.

[9] S. W. Carey, *op. cit.*, pp. 327-328.

one that, at least, would lead to an increase, rather than a decrease, in gravity. But where did the extra mass come from?

Although it has long been known that Earth receives a certain amount of material from micrometeorites every day, to say nothing of posited impacts, Carey dismisses it as "many orders of magnitude too small to make any significant contribution to Earth's volume and radius."[1]

Others have postulated that, originally, Earth's core was composed "of ultradense matter, which has changed slowly to 'normal' material, causing progressive expansion." But, once again, as Carey argues, "the pressure within the earth has never been great enough to produce the ultradense core postulated." And, in any case, if Earth's core had been denser in the past, the force of gravity at its surface would have been greater than at present which, as with other theories, would be exactly the opposite to what we are seeking.

Reverting to the Big Bang theory, *in which Carey does not believe*,[2] he pointed out that, according to this postulate, "all the matter of the whole universe, the raw material for 100 billion galaxies, appeared instantaneously from the void, from nothing." And this, he tells us, "transgresses the first axiom of physics, the law of conservation."[3] But then Carey himself tells us that new matter "is forever appearing...but is forever passing beyond our knowable universe."[4] Taking this concept further, he then claims that even "new galaxies constantly develop in the voids" while "other galaxies continuously vanish beyond the knowable horizon."[5] This would then keep the Universe in an absolute steady state. Thus, in answering the question concerning the source of Earth's accumulating mass, he offers the following:

> "At the center of the earth the gravity acceleration is zero. Hence matter should be entering there by random quantum fluctuations and at all other such places."[6]

Although he goes into all this in much detail, the end result is really not much different than that reached by Big Bang theorists. Matter is still being created out of nothing.[7] More than that, phrases such as "beyond our knowable universe" and "beyond the knowable horizon" have little scientific meaning since what is not knowable cannot be accommodated in an equation. This is not physics, but *meta*physics.

Future scholars will have to determine whether Earth has contracted or expanded—and there are even those who claim it did both at different times.[8] But since these theories do not answer the problem of Earth's past attenuated gravity, should we not look into the nature of gravity itself?

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[1] *Ibid.*, p. 326; see also J. Trefil, "Earth's Fiery Start," *Astronomy* (December 2007), p. 35.
[2] *Ibid.* (S. W. Carey), p. 330.
[3] *Ibid.*, pp. 330 ff., 343 ff.
[4] *Ibid.*, p. 343.
[5] *Ibid.*, p. 344.
[6] *Ibid.*
[7] See also P. S. Wesson, *op. cit.*, pp. 28, 53 ff.
[8] *Ibid.*, p. 145.

Let me start by saying that although gravity is one of the cornerstones of modern science, nobody knows what it is. While this force has been conjectured to exhibit the properties of a wave, it has also been surmised to display the characteristics of a particle stream. Worse than that—and this may come as a surprise to some—nobody knows how it really works. As John Boslough reported for *National Geographic*, gravity is the least understood force in nature.[1] Although its effects can be measured with precision, "nobody knows exactly what drives gravity—what makes it happen."[2] It is also "the only force man cannot [yet] control."[3] Despite the law it is supposed to follow, it often simply does not. Even here on Earth, let alone farther out in space, gravity is full of anomalies.

Take, for instance, the surprising discovery that Earth is gaining weight in its mid-section and thus affecting gravity which is getting stronger at the equator and weaker at the poles. This, however, must not be considered as proof of Earth expansion or, worse still, of a terrestrial increase in mass. What is happening is that, due to a change in oceanic circulation, which is brought about by Earth's slow isostatic rebound following the melting of the Pleistocene Ice Age, Earth's mass has been steadily shifting toward the equator.[4] The cause is thus a *redistribution* of mass, and thus affects localized gravitational intensity. And most terrestrial gravitational anomalies are due to similar causes since gravity is affected by localized concentrations of mass. This is why a weight at the end of a flexible line will be attracted out of the perpendicular when suspended close to a mountain or a cliff. The concentration of material in the mountain or cliff will have a greater pull on the weight. So, for instance, over the Indian Ocean *north of Madagascar*, where the Earth's surface actually bulges and the pull of gravity is particularly stronger than normal.[5] Gravity is also especially strong in central Africa and the Himalayas, while it is noticeably weaker in Hudson's Bay and the Indian Ocean *south of Madagascar*. And, similarly, with the lunar basins which, because of their denser material, create an immense gravitational pull, and which, in 1969, caused Neil Armstrong to miss his projected landing site *by seven kilometers*.[6] These anomalies, however, are well understood and there is nothing about them that will help us solve the problem with which we have burdened ourselves.

The study of gravity goes back to Aristotle (384-322 B.C.) who reached the false conclusion that heavy objects fall faster than lighter ones. In this he was deceived by the fact that a person can throw a light object farther than a heavier one.[7] It took Galileo Galilei (1564-1642 A.D.) to show that this could not be so. Galileo did not really drop objects off the leaning tower of Pisa to prove his case as generally believed. What he did was roll balls of different

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[1] J. Boslough, "Searching for the Secrets of Gravity," *National Geographic* (May 1989), p. 563.

[2] *Ibid.*, p. 576.

[3] *Ibid.*, p. 567.

[4] J. Winters, "The Strange Case of Earth's New Girth," *Discover* (January 2003 Special Issue), p. 52.

[5] J. Boslough, *op. cit.*, p. 581.

[6] *Ibid.*, p. 582.

[7] *Ibid.*, p. 567.

Aristotle—(384-322 B.C.)—who was perhaps the first to study gravity.
(Illustration by Charles Hogarth.)

weights down ramps through which he showed that objects fall at the same rate regardless of their individual weight.[1] But in the late 1900s came Ephraim Fischbach who showed that this, too, was a false assumption, a proposition that was then picked up by others. Objects of different weights *do* fall at different rates in accordance with their atomic makeup—"the more tightly packed the atomic nucleus, the slower the fall." This results in a force which opposes gravity—a weak one, to say the least, with only about one per cent of gravity's strength[2]—which physicists started calling the hypercharge, or fifth, force.[3] A ball of iron, with high binding energy, it has been argued, incurs a strong antigravity lift and falls slightly slower than a wooden ball of equal weight.[4]

Others, conducting different experiments, not only came to the same conclusion—although they offered different causes for the phenomenon[5]—but realized that objects dropped down into mine shafts and bore holes did not live up to expected gravitational pull. The deeper one goes into the Earth, the stronger should be its gravitational attraction since one would be closer to Earth's centre. But although various weights dropped into such depths did show an increase in gravitational pull, the additional attraction was less than predicted by Newton's law. True, we are here talking about micro-measurements (.0341 as opposed to .0345 percent) but that is besides the point.[6]

In opposition to the above, the higher one goes the lesser should be the pull of gravity for the simple reason that one would be moving farther from the centre of Earth. But researchers who conducted experiments on top of a 2,000-foot TV tower in North Carolina discovered that the gravitational pull on objects decreased much more rapidly than it should have. As if a theorized fifth force was not enough, the researchers suggested an additional "attractive, very-short-range sixth force" which "might be supplementing gravity (and overcoming the repulsive fifth) near the base of the tower."[7] Needless to say, it was inevitable that these suppositions would generate monumental controversy among physicists,[8] but that is always the case when old paradigms are upset. The theory has however been tested through various experiments by various others and the theorized discrepancy in gravity seems to have been validated.[9] The results of these experiments, however, have not led to the same conclusion. And there were experiments which showed no deviation at all.[10] But even if such a fifth and/or sixth force exists—and there are many who continue to deny their existence—it remains conditional to local variation. Earth's overall gravitational mass still pulls toward a single point at the globe's centre, overpowering all such local, and thus miniscule, deviations.

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[1] *Ibid.*

[2] *Ibid.*, p. 569.

[3] *Ibid.*, p. 570.

[4] *Ibid.*; J. Langone, "Was Sir Isaac All Wet?" *TIME* (August 15, 1988), p. 47; see also *New Scientist* (August 11, 1988), p. 29; *Scientific American* (October 1988), pp. 14-15.

[5] See for instance, "The Bigger they Are, the Faster they Fall," *Discover* (September 1987), pp. 15-16.

[6] T. Waters, "Gravity Under Siege," *Discover* (April 1989), pp. 18, 19.

[7] *Ibid.*, p. 18.

[8] J. Langone, *loc. cit.*; J. Boslough, *loc. cit.*

[9] *Ibid.*, pp. 570-571.

[10] *Ibid.*

Galileo Galilei (1564-1642)
Was he correct in deducing that objects of different weight fall at the same rate?
(Illustration by Bruce LaFontaine.)

One certainty that Boslough stressed is that gravity "governs our height and shape,"[1] as it must have governed the height and shape of previous organisms.

"We are children of gravity [Ralph Pelligra stated]. As we age, we reach a point when we begin to yield to it. Sagging skin and organs, varicose veins, arthritis, failing hearts—these all come from the lost battle against gravity. We can't touch it or see it. But it has guided the evolutionary destiny of every plant and animal species and has dictated the size and shape of our organs and limbs."[2]

Can you imagine what gravity would do to us had it been a great percentage stronger than at present? And can anyone imagine what the present state of gravitational attraction would have done to those 80-ton megasaurs?

SPATIAL GRAVITATIONAL ANOMALIES

Gravitational anomalies also take place in space. Take, for instance, what has now become known as the Magyary phenomenon. As discovered and described by Magyary, the Sun somehow deprives the Moon of part of its mass effect on Earth during solar eclipses.[3] Whether such effects are really due to lunar deprivations by the Sun, or to solar shielding by the Moon, temporary gravitational anomalies which affect Earth during solar eclipses have actually led some physicists to claim that there might be serious flaws not only in Newton's laws but also in Einstein's theory of relativity. Sensitive gravimeters give readings which fluctuate wildly during solar eclipses, while swinging pendulums tend to oscillate erratically, even to the extent of rotating backwards.[4]

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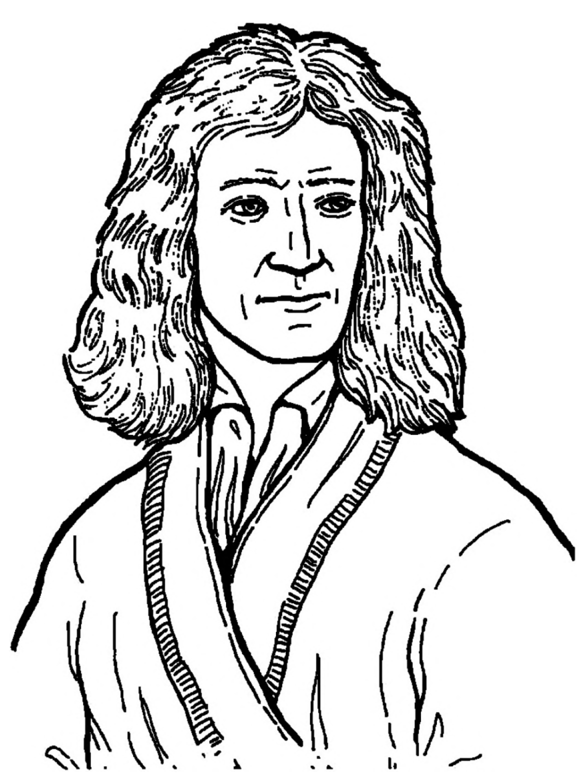
[1] *Ibid.*, p. 578.
[2] *Ibid.*
[3] H. A. Nieper, *Revolution in Technology, Medicine and Society* (West Germany, 1985), pp. 41, 46.
[4] *New Scientist* (November 27, 2004), pp. 28-31.

That gravity does not always and everywhere work the way it is claimed to do is evidenced by the nature of solar prominences. This was pointed out by Velikovsky in October 14, 1953 in an address he gave before the Graduate College Forum of Princeton University.[1] Visually, solar prominences consist of explosions of matter which arc out in plumes above the visible Sun's surface. They are ejected to great heights at very great speeds. When their explosive fury abates, however, they do not fall to the surface of the Sun in a continuation of their arcing path as a propelled missile will do on Earth. Instead, contrary to what the so-called law of gravity demands, these arcs retrace their paths to fall back on their point of origin. It is as if a projectile fired from a canon was to retrace its trajectory to return to the barrel of the gun.



Isaac Newton (1642-1727)
Temporary terrestrial gravitational anomalies during solar eclipses have led some physicists to claim that there might be serious flaws to his law of gravity.
(Illustration by Bruce LaFontaine.)

Velikovsky, however, realized that these trajectories were governed by the electro-magnetic field of the Sun, for which he was crucified by the astronomers of the time.

Some asteroids also fail to conform to man-constructed gravitational laws. One example involves the asteroid Eros. Its surface is littered with rubble, including rocks measuring up to 320 feet across. This rubble, and the craters which also pockmark the asteroid's surface, is claimed to have been derived through violent collisions with other asteroids. Yet its gravity is so weak that a ball flung from its surface would escape into space. As Joseph Veverka admitted, most of the debris should also have escaped the asteroid's gravitational clutches.[2]

> "Most of the ejecta from a violent collision would be traveling at a reasonable speed, and you would expect it to escape. So we simply don't understand why the surface is littered with so many blocks."[3]

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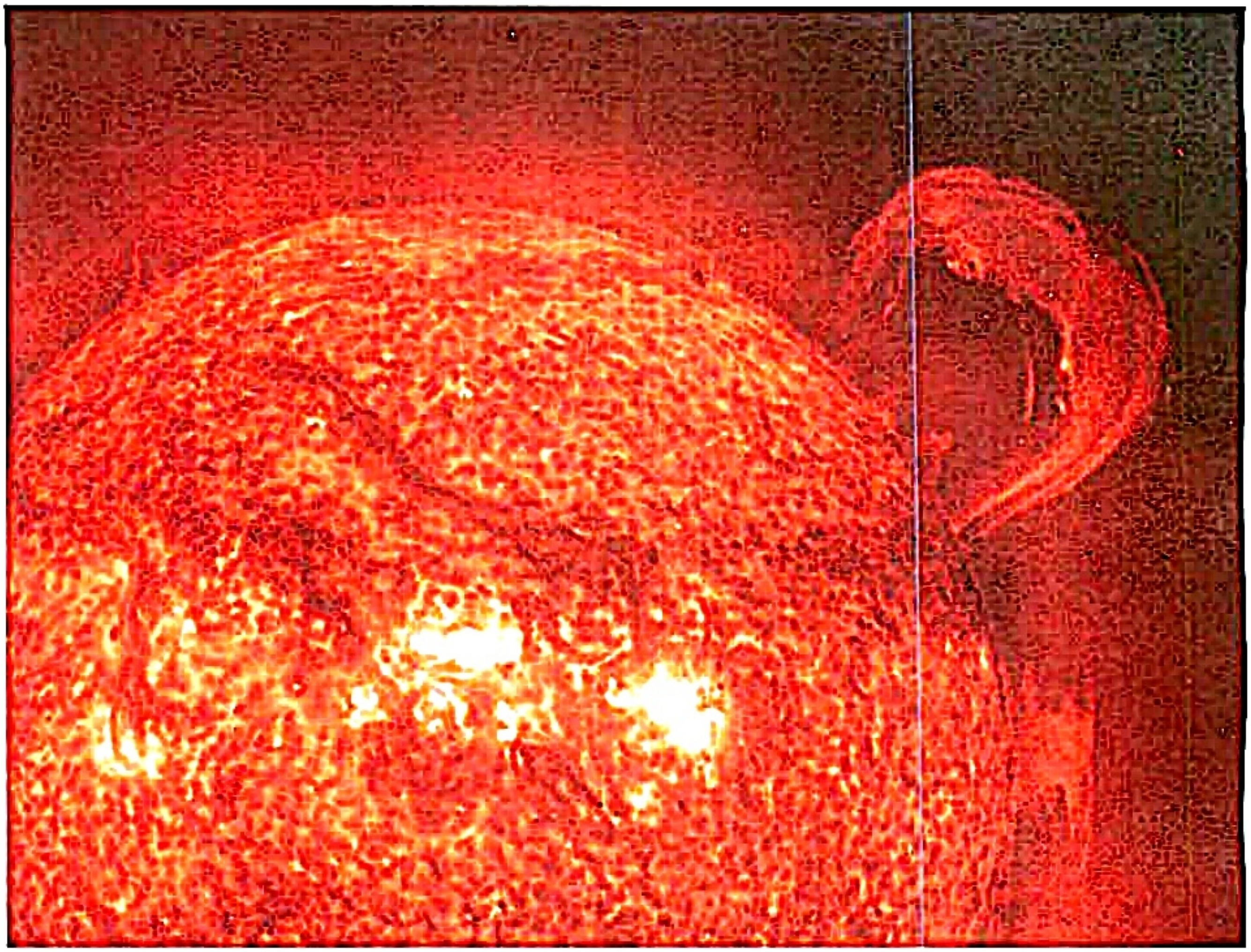
[1] I. Velikovsky, "Worlds in Collision *in the Light of Recent Finds in Archaeology, Geology, and Astronomy,*" published as a supplement to his *Earth in Upheaval* (N. Y., 1955), p. 292.

[2] J. Veverka, *Science* (September 1999) as quoted in "Eros: So Much Rock, So Little Gravity," *SIS Internet Digest* (2000: 2), p. 18.

[3] *Ibid.*



Why is it that solar flares, like the one shown above, defy gravity by retracing their explosive path to fall back on their point of origin?
(Photograph courtesy of NASA.)

Several possibilities were proposed by Veverka: "One is that we simply don't understand cratering events on small objects, and somehow the debris gets thrown out at very slow speeds," he tried. "Or the ejected material ends up in the same orbit as Eros, and over time the asteroid runs back into its own debris and gathers it up, *which is equally bizarre*."[1] But, in the end, he simply had to confess that: "We simply don't understand this."[2]

Another gravitational mystery confronts astronomers in Jupiter's satellite Io. This particular moon is littered with active, but very strange, volcanoes which somehow "spew plumes of gas and dust as much as 400 km high."[3] As the NASA Science News for September 14, 2004, reported:

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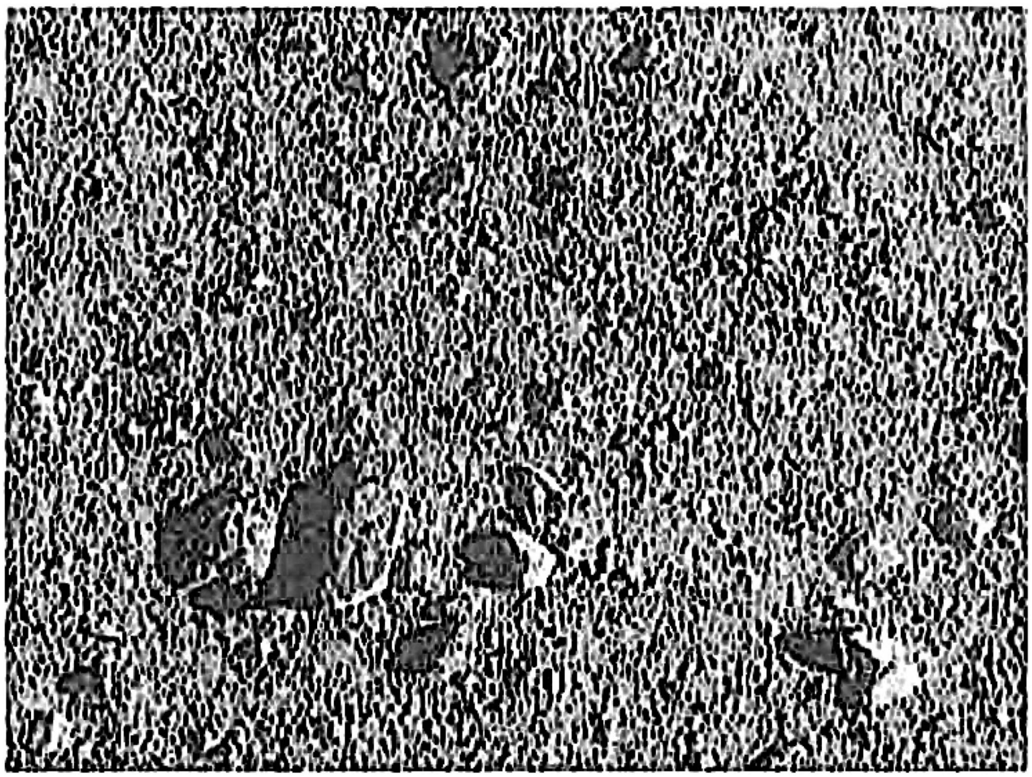
[1] *Ibid.* (emphasis added).

[2] *Ibid.*

[3] NASA Science News for September 14, 2004.



The impact-derived rubble-littered surface of the asteroid Eros.
How did Eros hold on to this debris despite its weak gravity?
(Photograph courtesy of NASA.)

> "At the apex of the plumes, some of the dust and ash that ought to turn around and fall...doesn't. Defying gravity, it keeps going up, not slowing but accelerating 2 times, 10 times, hundreds of times faster than a speeding bullet, away from Io into deep space."[1]

In 1992, on its mission to Jupiter, the Ulysses spacecraft was actually hit by such "a break-neck stream" of Ionian dust. This dust "came in a tight stream, like water from a garden hose," moving at 670,000 miles per hour. "This makes it some of the fastest-moving material in the solar system," Harold Krueger noted, "second only to the solar wind." The same thing happened to the spacecraft Galileo in 1995, as so, also, to the Cassini spacecraft in 2000 as it sailed past Jupiter on its way to Saturn.[2]

The mystery was thought to be solved when it was theorized that Jupiter's own spinning magnetic field creates an intense electric one which then accelerates Io's dust which is also electrically charged. But then, in 2004, when Ulysses revisited Jupiter, and was again hit by Io's dust particles, it was found that the dust was shooting in the wrong direction. "Io's dust is supposed to fly out of Jupiter's equatorial plane," said Krueger, "because that's the way the accelerating electric fields point." But on this occasion, Ulysses was approaching Jupiter's north pole where Io's dust is not supposed to reach. "Yet the spacecraft was pelted anyway."

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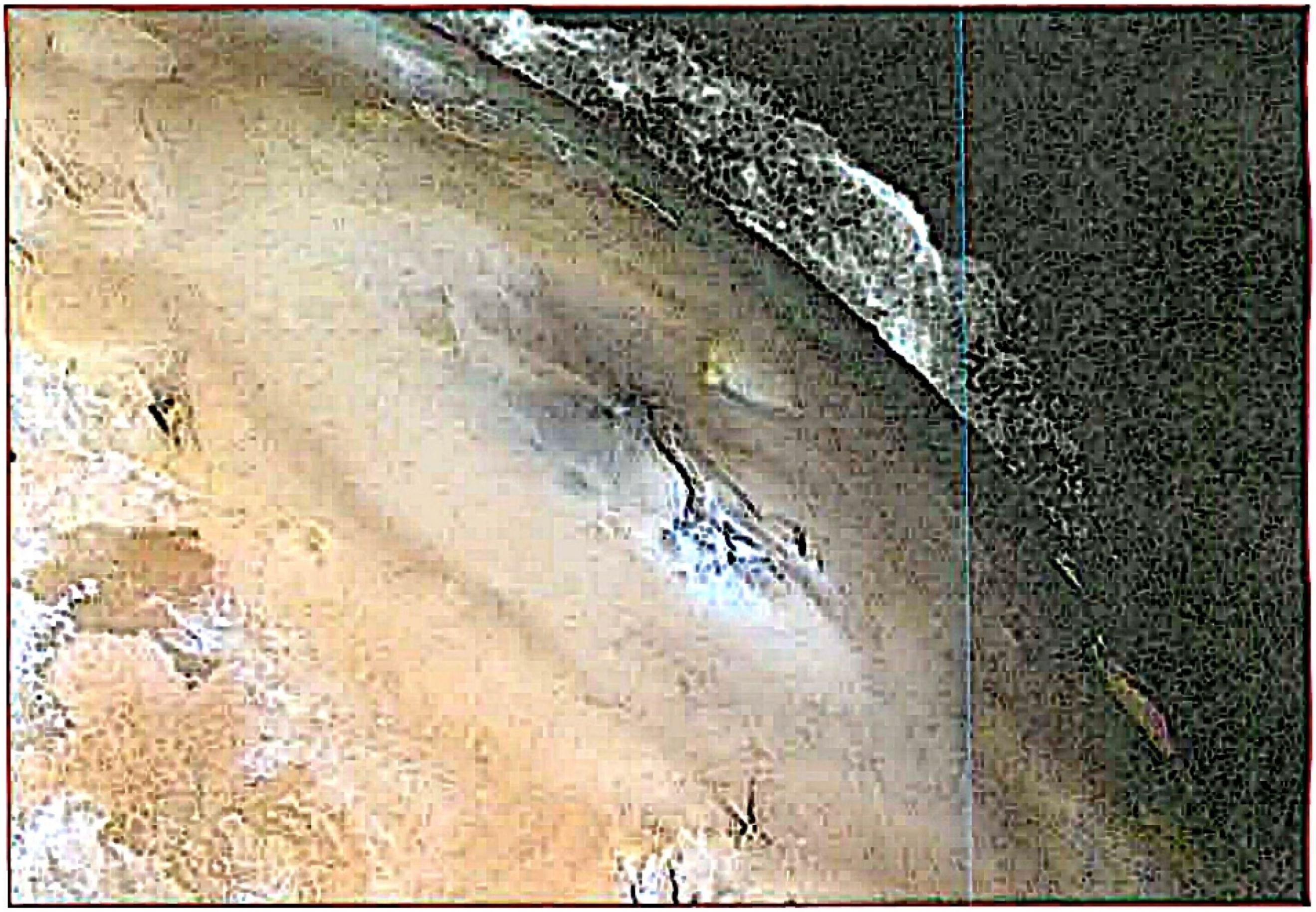
[1] *Ibid.*
[2] *Ibid.*



Gas and dust spewed by what has been claimed to be Io's volcanoes shoots right out into space. Not only does the ejecta not slow down, it actually accelerates.
(Photograph courtesy of NASA.)

It thus seems that Jupiter has the ability to fling Io's dust in any direction it pleases which, as Krueger admits, "is hard to understand."[1]

Comets, too, are notorious for disobeying Newton. Comets are seen to shed their famous tails as they travel toward, around, and away from the Sun. As they turn around the solar centre, their tails swivel around like rigid rods, always pointing away from the Sun. With the Sun's enormous gravitational attraction, the reverse should be true. Cometary tails should be attracted *toward* the Sun. Conventional theory wriggles out of this conundrum by claiming that cometary tails are composed of icy particles abraded off their nuclei and blown away by the force of the solar wind. But then we encounter comets which *do* sprout additional tails, sometimes called spikes, in the opposite direction, that is *toward* the Sun. The solar wind cannot be made to account for these sunward spikes. Nor is it reasonable to assume that tails and spikes owe their origin to different causes.

Meanwhile, spacecraft have been known to slow down contrary to plotted trajectories and signaled speeds, which indicates that gravity does not act upon them in the manner it should do.[1]

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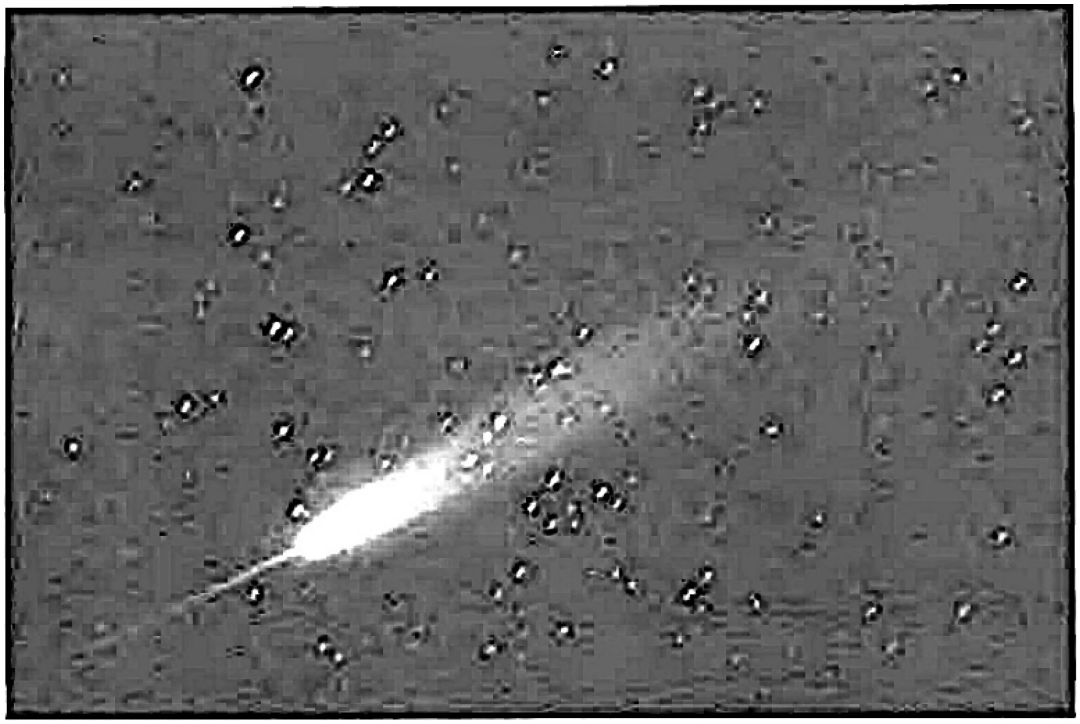
[1] *Ibid.*



Comet Arend-Roland displaying its famous sunward spike while its main tail points away from the Sun.
(Photograph courtesy of the Lick Observatory.)

Judging by gravitational theory, and what we see transpiring in the Solar System, the farther a celestial body is removed from its primary, the slower is its orbital period. Thus Mercury, the closest planet to the Sun, orbits much faster than Jupiter. And Pluto, much farther away, orbits much slower than the closer Saturn. This law, however, is violated by the speed of stars around their galactic centre. Those on the fringes of the galaxies' peripheries orbit much faster than those on the inner tracts. "In spiral galaxy after spiral galaxy...stellar material on the outer edges of a disk travels around at speeds much faster than theory had estimated."[2] As Philip Morrison exclaimed when this truth became known, it was "a big surprise."[3] Vera Rubin expressed similar puzzlement:

> "Our observations of galaxy rotation are simple, direct and clear. But the results found are a true puzzle, for they tell us that here is something major we just don't know."[4]

Needless to say, this applies just as well to our own galaxy. "Stars and gas in our galaxy's outer regions...circulate appreciably faster than Newton's law of gravity allows."[1]

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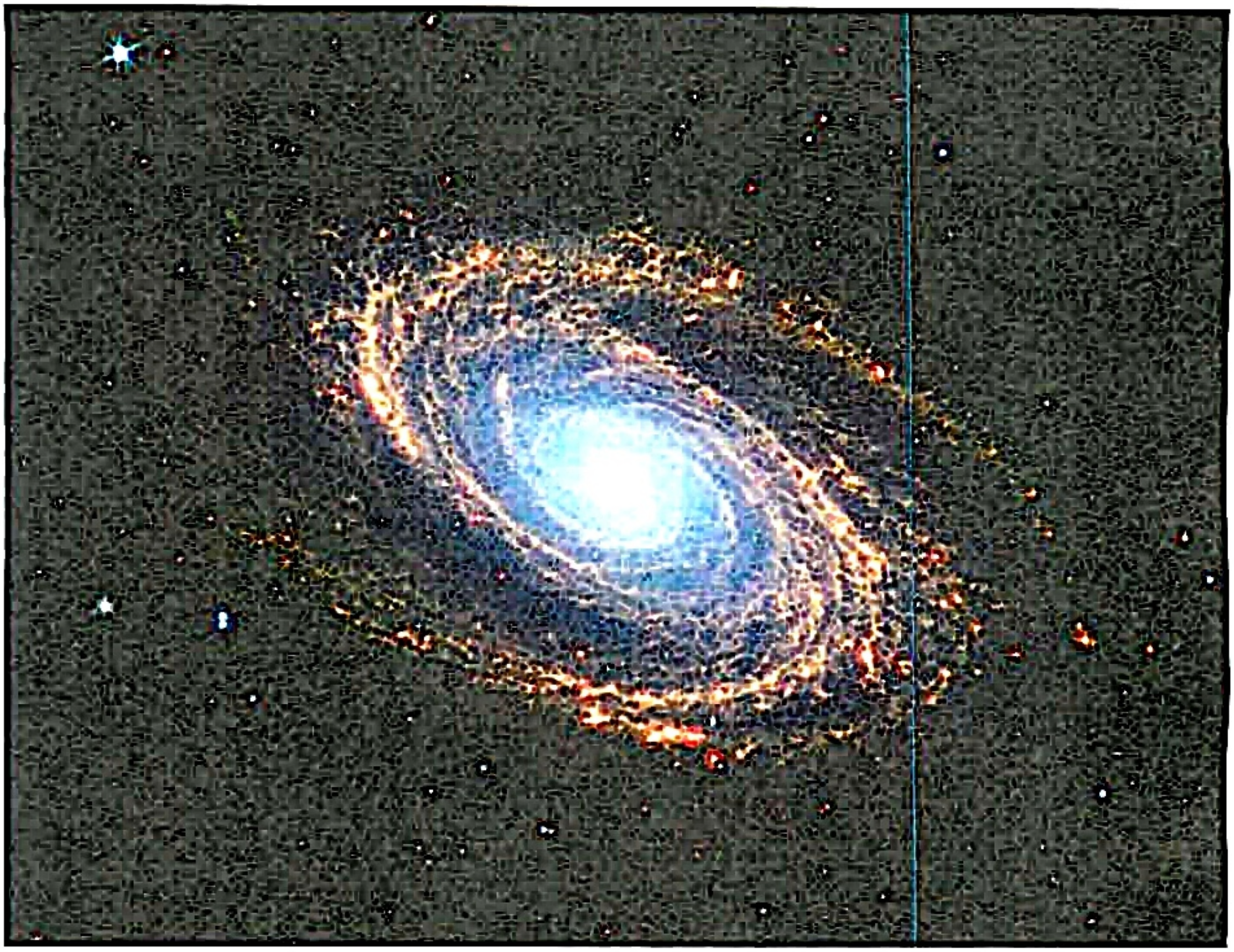
[1] See here *New Scientist* (September 12, 1998), p. 4.

[2] M. Bartusiak, *Thursday's Universe* (N. Y., 1988), pp. 189-191.

[3] P. Morrison, *The Ring of Truth* (N.Y., 1987), pp. 262-263.

[4] V. Rubin as quoted by C. Ginenthal, "Gravitational Anomalies not Explained by Conventional Wisdom," *AEON* II:1 (June 1989), p. 130.



Stars on the periphery of galaxies, such as the one dubbed M81 shown above, orbit much faster than those closer to the galactic center—a gravity-defying conundrum that forced physicists to invent the concept of dark, or unseen, matter.
(Photograph courtesy of NASA.)

This conundrum was eventually patched up by positing the unseen. As Marcia Bartusiak phrased it: "Not wanting to give up on Newton, theorists figure that the Milky Way must have a vast amount of 'dark,' or unseen, matter that keeps the speeding stars from flying out into intergalactic space." According to Martin Rees and others that followed him, this would mean that ninety percent of our galaxy—and, indeed, the entire Universe—is unaccounted for. That this patched-up theory showed its seams was admitted by Rees when he alluded to it as "an embarrassing fact."[2] Or, as Bartusiak had it stated:

"A few theorists have wondered whether these unexpected motions within galaxies...are actually telling us that Newton's law of gravitation breaks down over dis-

[1] M. Bartusiak, "Coming Home," *Discover* (September 1988), p. 37.
[2] *Ibid.*

tances of tens of thousands of light years. But this radical suggestion has not been greeted enthusiastically. *When faced with the necessity of accepting the existence of dark matter, or of modifying one of astronomy's theoretical cornerstones, most astronomers will opt for the former.*"[1]

Bartusiak's intuition was proven by Lawrence Krauss when he wrote that:

"It has been suggested that, if the force of gravity deviates from its Newtonian form at large distances, one might try to explain the flat rotation curves [of galaxies] without resorting to dark matter. *Unfortunately, this appears to be one of those cases in which the solution is uglier than the problem.* It may be slightly radical to suggest that galaxies are dominated by dark matter. *But to suggest an alteration of the known forces of nature to explain these observations seems to me excessive.*"[2]

Yet how much more *excessive* is it to invoke something that is not seen and which, as of this writing, has not yet been detected?

Israeli physicist Mordechai Milgrom, for one, had no use for dark matter. He would take dark matter out of galaxies altogether and replace it with an "extra-strong gravity." Named the Modified Newtonian Dynamics, or MOND, this new theory posited that: "While the familiar, conventional force of gravity gets weaker in proportion to the square of distance...there is also another form of gravity whose strength diminishes more slowly, declining linearly with distance."

In turn this is reliant on the known acceleration of galactic rotation below which "gravity switches from its normal form to the stronger form."[3]

Milgrom's concept, however, ran afoul of the predictions of relativity. But then Jacob Bekenstein, who hailed from the Hebrew University in Jerusalem, modified the theory, bringing it in keeping with what it had originally fouled up. He did this by the introduction of twin fields one of which gives rise to conventional gravitational phenomena, while the other serves as host to the other fundamental forces—the electromagnetic, the so-called strong, and the so-called weak forces.[4] It is not explained where Milgrom's "extra-strong gravity" comes from under this scheme. But let that be. Bekenstein is convinced that his modified theory of MOND "is consistent with observations of the solar system and beyond." And, as Marcus Chown reports: "Intriguingly, it predicts some subtle new effects that *might modify gravity in the outer solar system.*"[5]

Another person who attempted to save Milgrom's theory was Robert Sanders from the University of Groningen in the Netherlands. But he could only do so by reintroducing the very dark matter that Milgrom had sought to get rid of. That Milgrom could accept this was only

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[1] *Idem, Thursday's Universe* (N. Y., 1988), p. 191 (emphasis added).

[2] L. M. Krauss, *The Fifth Essence* (N. Y., 1989), p. 89.

[3] M. Chown, "Are There Two Types of Gravity?" *New Scientist* (January 22-28, 2005), p. 10.

[4] *Ibid.*

[5] *Ibid.* (emphasis added).

because this new dark matter was not really all that dark. "Even in a MOND universe," a *Scientific American* news scan reported, "some dark matter has to exist, but it could consist of 'normal' particles, such as neutrinos, instead of mysterious, undetected stuff."[1] As if neutrinos were not problematical enough.[2]

But let's leave all this heady stuff alone. All that I wish to stress is that, when it comes to gravity, physicists and astrophysicists are not averse to taking both Newton and Einstein to task.

REPULSIVE GRAVITY

Originally, when it came to the manner in which cometary tails sweep away from, rather than toward, the Sun, scientists like J. Herschel and W. H. Pickering had toyed with the idea of a repulsive force that somehow acted upon them.[3] Such dabbling was dropped with the adoption of the theory that it was the solar wind that was supplying the force which drove the loose material in cometary tails away from the Sun. And yet, the notion that gravity pushes rather than pulls was already in vogue in the early 1900s.[4] Critics might claim that we have come a long way since then. But notice how the idea resurfaced in the 1980s. Take, for instance, the discovery of the Uranian rings, all of them much narrower than the ones circling Saturn. One of them is only three kilometers wide. The outer one is highly eccentric with a width that varies between 20 and 100 kilometers.[5] The Saturnian rings, together with the gaps between them, had been theorized to be kept in place through resonance. But Peter Goldreich and Scott Tremaine came to the conclusion that resonance cannot account for the formation of the Uranian ones. What they claimed, instead, was that it was a bevy of as yet unseen satellites that was responsible for these.[6]

> "Two satellites orbiting close together [Goldreich explained] can confine small particles [like those of the Uranian bands] in between them into a thin ring. *Gravity causes each satellite to repel the particles in its vicinity.*"[7]

The way in which this transpires, according to Goldreich, is complex enough and we need not go into all that. Let it merely be known that, as always, there were many who "considered such gravitational gamesmanship unconvincing."[8] At the time, Goldreich himself was more bothered with the unseen satellites he required for his postulate than he was with the antics of gravity. "It's a terrible thing to have to make a model when you need nine or so little satellites

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[1] G. Schilling, "Dark Riddles," *Scientific American* (November 2007), p. 33.

[2] See here *God Star*, pp. 248-251, 416.

[3] W. Thornhill, "Fallacies of Gravitation," *THOTH* —private electronic Newsletter sponsored by KRONIA Communications—Vol. II, No. 6 (March 31, 1998), p. 7.

[4] H. A. Nieper, *op. cit.*, p. 45.

[5] R. Gore, "Riddles of the Rings," *National Geographic* (July 1981), p. 11.

[6] *Ibid.*

[7] *Ibid.* (emphasis added).

[8] *Ibid.*, p. 12.

that can't be seen," he conceded, "but I have no doubt that [the model he proposed] is correct."[1]

Goldreich was vindicated when it was discovered that the rings of Saturn owe their configuration to a set of "shepherding moons" which act exactly as he had theorized for the rings of Uranus.[2] More than that, as it was eventually discovered, there are no "obvious resonances" acting on the rings and moons of Uranus, again as predicted by Goldreich.[3] And, finally, the extra Uranian moons required by Goldreich's theory were discovered—first two,[4] then three more,[5] and twenty-seven as of this writing.[6] More importantly, it was also established, very much in keeping with Goldreich's theory, that "in [planetary] rings, gravity can effectively repel material."[7]

Critics will again tell us that Goldreich's particles are not being acted on by repulsive gravity, but that their apparent repulsion is merely due to the net outcome of their acceleration and deceleration in response to the particular satellite which pulls the particles closer to it, thus slowing them down, but speeds them up as it then pulls them after it.[8] And yet an anomaly which seems to indicate gravitational repulsion is met with in the two shepherding moons sharing the same orbit with Saturn's satellite Dione. As Earl Milton described the situation: "The curious pair of moons in Dione's orbit is interacting such that the trailing moon was described as *pushing* the leader."[9]

> "The pushing of Dione A by B, as seen by Voyager, provides an illustration of both the conception of a repulsion (or gravitational push) and the effect of the neighbouring satellites in keeping these two rocks in similar orbits."[10]

Whether real or merely apparent, the repulsive nature of gravity is so persistent that astrophysicists themselves found reason to posit a new force which they now call mock gravity. This had to do with the early Universe following the theorized Big Bang. In the beginning, they now claim, individual dust particles were so close together that they shielded one another from the pressure of radiation. But radiation pressure from outside would have pushed the particles closer together, creating clusters of dust which in time, as more matter accreted, condensed until entire galaxies were formed. As Craig Hogan and Simon White, who then hailed from the University of Arizona, proclaimed, this mock gravity is strictly speculative. "We

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[1] *Ibid.*

[2] *Ibid.*

[3] D. Overbye, "Voyager Was on Target Again," *Discover* (April 1986), p. 78.

[4] See "New Moons of Uranus—Update," *Astronomy* (March 1998), p. 32; *Scientific American* (January 1998), p. 22; *New Scientist* (March 28, 1998), p. 23; *ibid.* (November 8, 1998), p. 29.

[5] R. Talcott, "Breaking Up is Easy to Do," *Astronomy* (October 2001), p. 30.

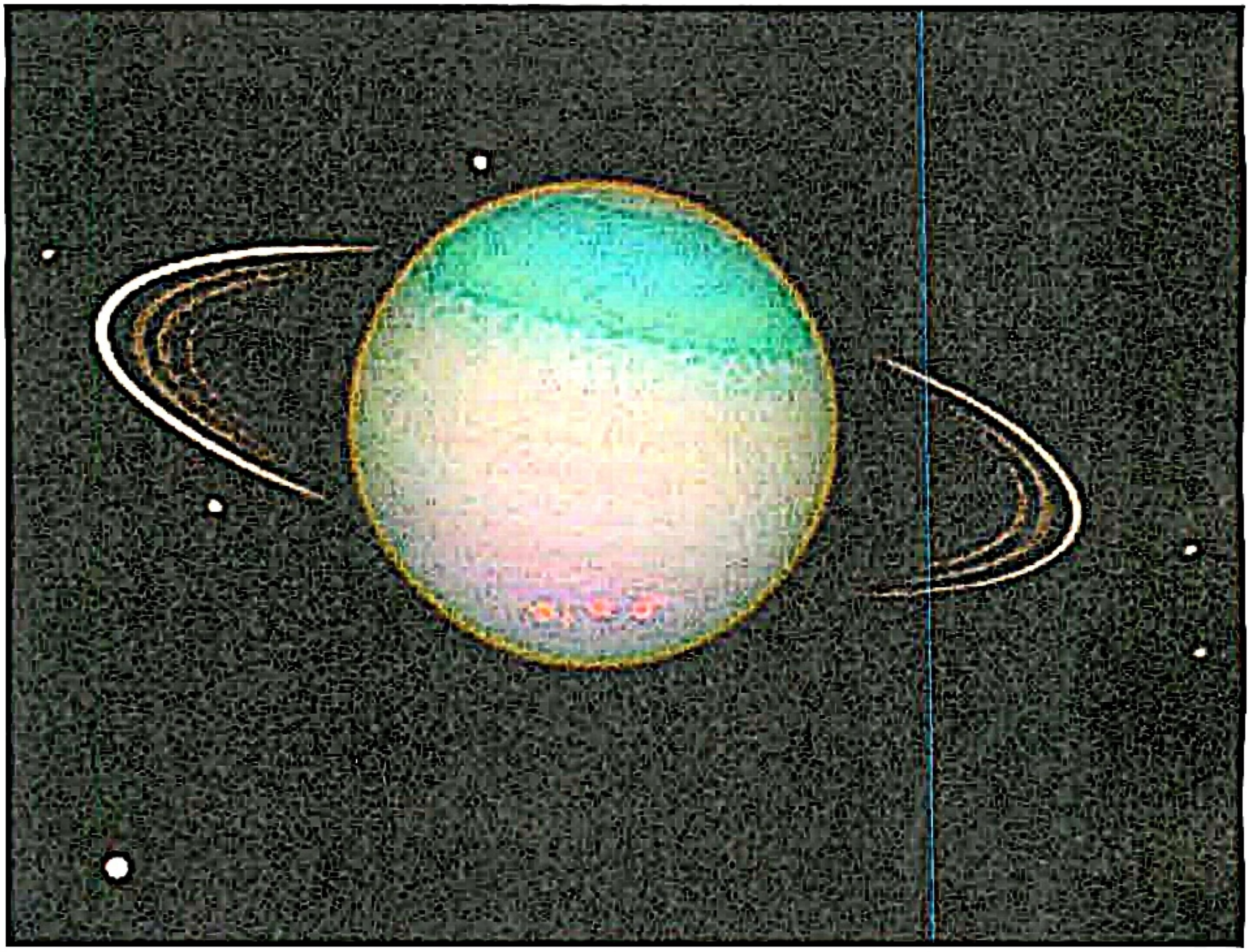
[6] M. K. Baumann, *et al.*, *What's Out There* (London, 2005), p. 161; D. Tytell, "Uranus's New Rings," *Sky & Telescope* (April 2006), p. 18.

[7] J. A. Burns, *et al.*, "Bejeweled Worlds," *Scientific American* (February 2002), p. 66.

[8] *Ibid.*, p. 70; R. Gore, *op. cit.*, p. 11.

[9] E. R. Milton, "Saturn and Voyager," *KRONOS* VI: 3 (Spring 1981), p. 61 (emphasis as given).

[10] *Ibid.*



In planetary rings, such as those of Uranus shown above, gravity can effectively repel material. (Photograph courtesy of NASA.)

were intrigued by the possibility that something so offbeat and contradictory to prevailing thought," said White, "might have been responsible for the creation of the universe as we know it."[1]

For us it matters little whether the Big Bang theory will survive mankind's future belief. What matters is that theories concerning the repulsive nature of gravity under extreme cases are not of themselves disallowable in mainstream thinking. Never mind the dictum that gravity *always* attracts, that it *never* repels.[2] Donald Goldsmith even told us why gravity can never repel. Mass, he tells us, "comes only in one 'charge,' so that gravitational forces always attract and never repel."[3] As he adds: "Negative mass, or at least 'negative gravity,' plays a role in more than one novel, but physicists do not regard the concept as a serious possibility for the real world."[1]

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[1] S. Boxer, "The Force that May (or May Not) be With Us," *Discover* (October 1986), pp. 9, 12.

[2] See for instance, J. Boslough, *op. cit.*, p. 567.

[3] D. Goldsmith, *Einstein's Greatest Blunder?* (Harvard University, 1995), p. 148.

Goldsmith was of course wrong when it comes to what physicists believe concerning gravity. Three years after he penned the above words, researchers working on supernovae came to the conclusion that space has to be filled with a repulsive force of unknown origins.[2] Never mind the reasons why. Besides, whether one believes in the existence of dark energy or not, it was eventually concluded that its gravity, too, repels.[3]

THE GRAVITATIONAL CONSTANT

Fifth force, sixth force, apparent repulsive gravity, mock gravity, extra-strong gravity—the only thing that received *unanimous* acclaim was the gravitational constant. This constant, usually rendered simply as "G," which was discovered by Henry Cavendish in 1772, given by him as 6.754×10^{-8}, but since refined to 6.673×10^{-8}, is the force that a body with a mass of one gram exerts upon another body with the same mass at a distance of one centimeter. Being constant, it is inviolable. Or so it had been thought. As the editors of *Nature* commented in 1976: "'Every schoolboy knows' that gravitational attraction varies inversely as the square of the distance between the attracting masses—or at least *it used to be* common knowledge."[4]

The above comment concerned the results of an experiment conducted by Daniel Long. Laboratory measurements of the gravitational constant suggested a shift in the constant's value with changing distances between bodies—or, in other words, with the separation of the masses involved.[5] What the experiment showed was that the larger the separation between two bodies, the larger was the value of G. "In other words, Long suggests that the inverse square law is not valid, and that we have to add an additional short-range repulsion."[6] And: "Long's experiment indicates that the limiting values of G at large distances may be several percent higher than is presently accepted."[7] Of course, as usual, not everyone accepted Long's results, especially since, as Long himself admitted, the experiment was encumbered by Earth's own gravitational field.[8]

Further indications that all is not well with the gravitational constant came from the experiments conducted in mines and bore holes discussed above. Variations of G with depth because of the change in rock density was thought to be well understood. In fact these variations with depth permits geologists to calculate the density of rock strata. Conversely, when such density is already known, calculations can be performed to check the constancy of G. When these experiments were conducted, it was found that *all* of the cited estimates of G turned out to be greater than theory demanded. While they were not touted as proof, these results were at

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[1] *Ibid.*

[2] *Scientific American* (May 1998), p. 14.

[3] E. Crew, *et al.*, "The Mysteries of Space," *Chronology & Catastrophism Review* (2001:2), p. 42.

[4] "Inverse Square Law for Gravity?" *Nature* (April 1, 1976), p. 395 (emphasis added).

[5] D. R. Long, "Experimental Examination of the Gravitational Inverse Square Law," in *ibid.*, pp. 417-418.

[6] "Inverse Square Law for Gravity?" (See above).

[7] *Ibid.*

[8] D. R. Long, *op. cit.*, p. 418.

least accorded the honorary degree of "strong circumstantial evidence" for the failure of Newton's inverse square law at short range.[1]

Terrestrial variations of G with time[2] received an additional boost from John Ferguson who claimed that its cause is to be sought in the slow change of cosmic environment as the Solar System orbits the galaxy. Ferguson himself applied this to the ups and downs of terrestrial gigantism. Thus, according to him, G would have been rather higher than at present during the Palaeozoic era, which would have favored marine life while stunting land-based aggregates. And, still according to him, the opposite would have prevailed during the Mesozoic era, with G considerably lower than at present, enabling the largest of the dinosaurs to walk on land.[3] If nothing else this shows that dinosaur viability due to an attenuating gravity was beginning to gain a wider patronage.

As Warren Carey of Earth-expansion fame has noted, the inconstancy of the gravitational constant has been suggested by some very influential astronomers of the twentieth century. Among them Carey lists Paul Dirac, Pascaul Jordan, Robert Dicke, D. Ivanenko, and R. Sagitov. According to these authorities, however, the gravitational constant has been diminishing rather than increasing.[4] But then so little is known about gravity that three separate attempts to nail it down once and for all, conducted in the early 1990s, came up with results that were not only markedly different from the theoretical value, but different from each other. While two of these results indicated a lower value for G, the other showed a higher one.[5] But that Earth's gravity has changed over time has been accepted by quite a few.[6]

ELECTROMAGNETISM VERSUS GRAVITY

When, earlier in this chapter, we claimed that nobody knows what gravity is, we were not speaking out of turn. Even Newton had to confess his ignorance when it came to the cause of gravity.[7] That was in 1690. By 1877 Clerk Maxwell was in no better position. "In his Principia, Newton says nothing about the means by which bodies are made to gravitate towards each other," he was correct in pointing out. "The attempts which have been made since the time of Newton to solve this difficult question are few in number, and have not led to any well-established result."[8]

So, similarly, with Robert Dicke who, in 1959, could still lament that:

> "In any case, it appears that there is little reason for complacency regarding gravitation. It may well be the most fundamental and least understood of the interactions."[9]

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[1] "Geophysical Evidence for Non-Newtonian Gravity," *Nature* (July 16, 1981), pp. 230-232.

[2] And see here P. S. Wesson, *op. cit.*, pp. 29, 45.

[3] J. Ferguson, *The Guardian* (September 24, 1981), p. 13.

[4] S. W. Carey, *op. cit.*, p. 327

[5] V. Kiernan, "Gravitational Constant is Up in the Air," *New Scientist* (April 29, 1995), p. 18.

[6] *New Scientist* (January 17, 1998), pp. 39-42.

[7] H. A. Nieper, *op. cit.*, p.51.

[8] *Ibid.*

[9] *Ibid.*

And likewise John Boslough in his matter-of-fact statement. "Though familiar as a falling apple, gravity remains the least understood force in nature," he wrote.[1] "Of the four known natural forces," he went on, "gravity was the first seen but is the least understood."[2]

Wallace Thornhill, too, came straight to the point when he argued that "we have no understanding of gravity at present."[3] As he noted, "having a mathematical 'law' describing gravity does not mean that we understand it."[4]

By the turn of the century, Dick Teresi, past Editor of *Omni*, was still noting that "nobody knows how [gravity] fits into the standard model."[5] "All the particles and forces in the model are quantized," he goes on, "that is, they follow the rules of quantum theory." But, as he tells us: "There is yet no theory of quantum gravitation."[6]

> "The standard model is less than satisfying. Scientists think that besides being incomplete, it's too complicated. There must be a simpler plan...
>
> "Another problem is mass. All the particles have different masses, and no one knows where these come from...Why, in fact, should the particles have any mass at all? Where does it come from?"[7]

Nor has the situation changed as of this writing. The editors of *Discover* were quite blunt when they stated that: "Three centuries after Isaac Newton, we don't really know what gravity is."[8] And this was echoed somewhat more fully by Tim Folger in the same issue:

> "Gravity is the only one of the forces that physicists have been unable to explain in quantum terms. Albert Einstein spent more than 30 years in fruitless attempts to harmonize his theories of gravity with quantum mechanics, and his successors are still stumped...Most believe that quantum theory is fundamentally sound but that our understanding of gravity must change."[9]

What understanding of gravity?—one may ask.

When Donald Goldsmith stated that gravity cannot repel, he was basing his claim on the dictum that mass comes in only one charge.[10] But in this he was comparing gravity to electromagnetism.

> "Two of the forces—gravity and electromagnetism—act over large distances...For that reason, when scientists look at the big picture, gravity and electromagnetism

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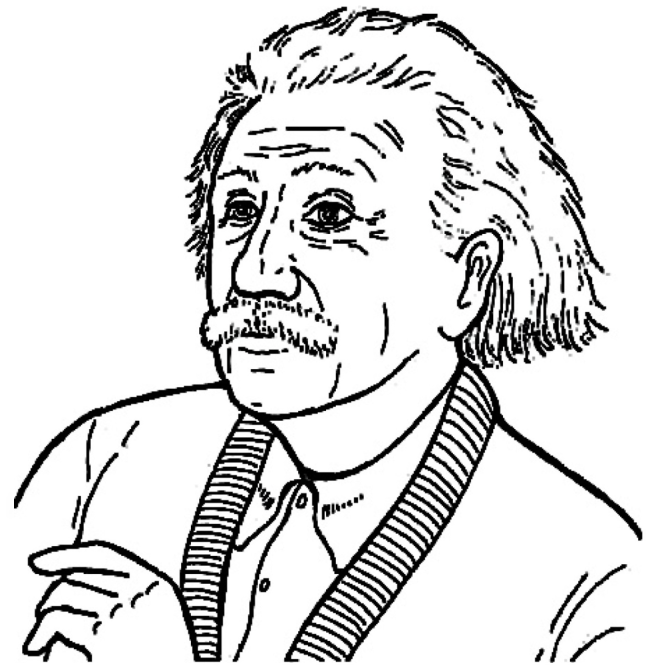
[1] J. Boslough, *op. cit.*, p. 563.
[2] *Ibid.*
[3] W. Thornhill, *The Electric Universe* (Beaverton, Oregon, 1997), p. 10.
[4] *Ibid.*, p. 12.
[5] D. Teresi, *Lost Discoveries* (N. Y., 2002), p. 196.
[6] *Ibid.*
[7] *Ibid.*
[8] "The (Long and Winding) Road to Reality," *Discover* (June 2005), p. 27.
[9] T. Folger, "If an Electron can be in 2 Places at Once, Why Can't You?" in *ibid.*, p. 33.
[10] D. Goldsmith, *loc. cit.*



Albert Einstein spent more than 30 years in fruitless attempts to harmonize his theories of gravity with quantum mechanics, and his successors are still stumped.
(Illustration by Bruce LaFontaine.)

naturally draw attention. Both types of forces behave the same way with increasing distance: The strength of the force between any two objects decreases in proportion to the square of the distance between them. For gravity, the amount of force between two objects varies with the product of the *masses* of the two objects. Electromagnetic forces, in contrast, care nothing for objects' masses; instead, the amount of electromagnetic force between two objects increases in proportion to the product of the objects' *electric charges.*

"...Electric charges come in two varieties, positive and negative, and the electromagnetic force between two objects can likewise be either attractive (between a positively and a negatively charged object) or repulsive (between two positively charged or two negatively charged objects). But mass comes in only one 'charge,' so that gravitational forces always attract and never repel."[1]

But what if gravity *is* an electro-magnetic, or electrically, related force? After all it has for long been conceded that, theoretically, gravity waves are the mathematical analogue of electromagnetic ones.[2]

Goldsmith may well tell us that the difference between the electromagnetic force and gravity allows the latter "to dominate the universe at large distance scales."[3] But whether physicists admit it or not, this has always been something of a conundrum since, as Goldsmith himself tells us, gravity is not only weaker than magnetism, but is "by far" the *weakest* of the basic forces known to science.[4] Why should this weakest of forces dominate the Universe "at large distance scales" when, just like gravity, the much stronger electromagnetic force is also known to act at "long range"?[5]

[1] *Ibid.*, pp. 147-148 (emphasis as given), and see also p. 182.
[2] K. S. R. Engel, "Do Gravity Waves Exist?" *Science Digest* (February 1982), p. 71.
[3] D. Goldsmith, *op. cit.*, p. 148.
[4] *Ibid.*, p. 182; see also D. B. Cline, "The Search for Dark Matter," *Scientific American* (March 2003), p. 54.
[5] D. Goldsmith, *loc. cit.*

Boslough, too, confirms that "gravity rules the universe" even though, like Goldsmith, he is forced to admit that "the other forces," including electromagnetism, "are trillions of times stronger."[1]

> "Take any kitchen magnet, for instance. Its electromagnetic field is stronger—over a space of a few inches—than the earth's *entire* gravitational field. Earth's gravity field is so weak that when you pick up a rock, your muscles are easily overcoming the pull of the planet's entire 6, 000, 000, 000, 000, 000, 000, 000, 000 kilograms (6.6 sextillion tons)."[2]

As already noted, Immanuel Velikovsky was of the opinion that it is "not gravitation, but electric attraction and repulsion and electromagnetic circumduction [that] govern the solar system."[3] And although Lynn Rose sought the past attenuation of terrestrial gravity in the pull exerted by the close proximity of proto-Saturn, he, too, was of the belief that this "would be in addition to, or supplementary to, the electrical phenomenon proposed by Velikovsky."[4] And so, likewise, Theodore Holden who suggested "electro-magnetic forces which are no longer in evidence"[5] as one possibility for attenuated gravity, an idea to which he was later to return.

Critics might lambaste the three above-mentioned persons as pseudo-scientists. They should, however, keep in mind that the electromagnetic origin of gravitation was advocated by the Nobel laureate Hendrik Lorentz and Jules Henri Poincaré, both considered giants in the history of science. Even earlier, in 1872, Friedrich Zollner had also presented a thesis that was almost identical to Velikovsky's.[6]

More recently an electromagnetic theory of gravity was postulated by Melvin Cook, receiver of the Nitro-Nobel Medal, in a major work the subject of which does not immediately bring gravity to mind.[7] While Cook's theory is too technical to be easily understood except by those well versed in plasma physics, Robert Bass, himself a Rhodes Scholar, found much to laud in it. "This is a theory of gravity which in my opinion passes every observational test," he wrote. "It's very unorthodox—radically unorthodox—and not yet widely known; but in my opinion it's totally consistent with every observation ever made."[8] Even so, as iconoclastic as he himself is, Bass refrained from passing a final verdict on Cook's theory[9] which, as of this writing, is still "not yet widely known."

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[1] J. Boslough, *loc. cit.*

[2] *Ibid.* (emphasis added).

[3] I. Velikovsky, "Cosmos Without Gravitation: Attraction, Repulsion, and Electromagnetic Circumduction in the Solar System," (1946), p. 22.

[4] L. E. Rose, "Variations on a Theme of Philolaos, " *KRONOS* (Fall 1979), p. 33.

[5] T. Holden, "The Sauropod Dilemma," *AEON* II:4 (May 1991), p. 117.

[6] See "Society News," *Society for Interdisciplinary Studies Workshop* 5:1 (1982), p. 2.

[7] M. A. Cook, *The Science of High Explosives* (N. Y., 1971), pp. 420-426.

[8] R. W. Bass, "The Celestial Dynamics of 'Worlds in Collision'," *S.I.S. Review* VI:1-3 (1982), p. 74.

[9] *Ibid.*

Again, critics will point to various differences that separate the gravitational force from electromagnetism.[1] And yet a relationship between the two has continued to be sought, not only by iconoclasts, but also by the most orthodox of scientists. That electromagnetism and gravity influence one another has been suggested by Jean-Paul Mbelek and Marc Lachieze-Ray of the French Atomic Energy Commission. These two researchers calculated the value of G that they expected to find at different locations around the world. According to them, the pull of G should be stronger in those localities where Earth's magnetic field would be stronger, with the highest measurements expected at the north and south magnetic poles. As subsequently measured, values of G conformed with their theory.[2] (Whether this contradicts what was deduced through Earth's gain of girth, as noted above, remains to be seen. One thing to note is that this increase in girth, and thus in weight, along Earth's mid-section, has been said to have resulted in gravity getting stronger at the equator and weaker at the poles, but not necessarily stronger at the equator *than* at the poles.)

Clifford Will disagreed, although not so much with the results, but definitely with the conclusions drawn from them,[3] despite the fact that the results were themselves in conformity with their prediction. And is verified prediction not considered one of the mainstays of a correct theory? On the other hand, Will had made his reputation as a gravity theorist at Washington University in St. Louis, Missouri, and he had a lot to lose in face of Mbelek and Lachieze-Ray's findings.

And yet there is no doubt that, *although related*, gravity and electromagnetism are two separate forces. Were it not so, for one thing, we would not require two different instruments to record each one of them. More importantly, however, is the fact that gravity cannot be shielded, whereas electromagnetism can.

SUB-ATOMIC DIPOLARITY

It was at the September 1982 annual general meeting of the Society for Interdisciplinary Studies that Wallace Thornhill introduced the physicist Ralph Sansbury as his guest. The editor of what was then a new periodical, *Journal of Classical Physics*, Sansbury elated his audience by informing them that a few articles which his journal had recently published overlapped Velikovsky's 1946 paper "Cosmos Without Gravitation." Sansbury himself is convinced that gravity is "a sort of electrostatic phenomenon." At the core of his theory was the additional belief that "the dipolar nature of matter could be taken to the sub-atomic level, and that all atoms could be considered as dipolar, from an electrical point of view, and arranged so that attraction exceeded repulsion."[4] In a way this was an extension of Melvin Cook's theory, mentioned above, which only took matters down to the molecular level.[5]

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[1] See for instance, L. Ellenberger, "Of Lessons, Legacies, and Litmus Tests: A Velikovsky Potpourri," Part One, *AEON* III:1 (November 1992), p. 95.

[2] M. Brooks, "Earth's Magnetic Field 'Boosts Gravity'," *NewScientist.com* (September 20, 2002).

[3] *Ibid.*

[4] "Society News," *Society for Interdisciplinary Studies Workshop* 5:1 (1982), p. 1.

[5] *Ibid.*, p. 2.

The manner in which this sub-atomic dipolarity is achieved is explained by Sansbury through his postulate that an electron is composed of two or more orbiting particles, which he calls subtrons, with a total charge that equals that of the electron. It is these orbiting subtrons that create an electronic dipole when the electron is subject to an electric field. From this he also assumes that electromagnetic forces act instantaneously and that gravitation itself is simply a weak electrostatic force induced by oriented dipoles.[1]

Among other things this would mean that electrons are not the fundamental particles they are believed to be. They, too, have structure. It also means that Sansbury's posited subtrons would orbit their parent electrons "at speeds far in excess of the speed of light."[2] As Thornhill stated, "with this simple 'real world' model Sansbury was able to derive all of the important fundamental equations of physics which are known to work" and that recent experiments in particle accelerators suggest that Sansbury is right on target. Gravity, as Thornhill explains it, is the result of electrostatic polarization of nucleons, including Sansbury's subtrons, in an atom. *If this is correct, it then follows that a cosmic body's gravity can be modified by varying the charge on that particular body.*[3]

It is Sansbury's theory that Holden and other scholars ended up accepting as the reason behind Earth's past attenuated gravity and the gigantism of past terrestrial fauna,[4] despite the fact that, as of this writing, Sansbury himself remains uncertain concerning the actual cause.[5]

CHANGES IN ELECTRICAL POTENTIAL

The Sun supplies the dominant force of gravity in the Solar System and thus on Earth. But during the time when the proto-Saturnian system had been traveling alone in space out of the Sun's domain, the dominant force of gravity on Earth would have been supplied by proto-Saturn. That much is easy to understand. But if gravitation is dependent on electric charge, it would follow that Earth's gravity would have been reliant on *proto-Saturn's* electric charge. Moreover, proto-Saturn's electric charge would itself have been different than Saturn's present electrical potential—and this for two reasons: (1) obviously, together with Earth, proto-Saturn would not yet have become a member of the Solar System, and thus not yet prone to the electric stress imposed by the Sun; and (2) prior to its flare-up, proto-Saturn would have been more massive.

> "If gravity is essentially an electrostatic phenomenon [Thornhill succinctly elucidated], the unusual environment of the Saturnian configuration would be expected to have caused a difference in the perceived gravity at the surface of the Earth. It is con-

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[1] R. Sansbury, "Electron Structure," *Journal of Classical Physics* I:1 (January 1982), as reviewed by W. Thornhill, *Chronology & Catastrophism Workshop* (1986:1), pp. 34-35.

[2] W. Thornhill, *The Electric Universe* (Beaverton, Oregon, 1997), p. 96.

[3] *Ibid.*, pp. 96-97; *idem*, "New Physics Support Planetary Catastrophism," *Chronology & Catastrophism Review* (1998:2), pp. 12-13; *idem*, "Electrical Gravity," *THOTH* III:5, electronic newsletter sponsored by KRONIA Communications (March 15, 1999), p. 4; *idem*, "The Electric Universe," *Chronology & Catastrophism Review* (2000:1), p. 81.

[4] T. Holden, *Dinosaurs, Gravity, and Changing Scientific Paradigms* (2004), pp. 80 ff.

[5] *Ibid.*, p. 88.

ceivable that the electric stress within the plasma sheath enclosing the [proto-Saturnian system] was less than that which the Earth endures in its current solar environment. This would result in an effective lower gravity."[1]

For a somewhat more technical explanation, Thornhill offered the following:

"In proto-Saturn's environment, we were engulfed in the phenomena close to the anode [of proto-Saturn's plasmasphere], where there were regions of a strong electric field, and the energy available was consequently much greater. Earth orbited within the red anode glow of proto-Saturn. The boundary of the anode glow is a double-layer sheath with an inner positive-ion space charge and an outer electronic space charge. It is the energy radiated by the spherical shell of the anode glow that would have given equal energy per square meter over the entire Earth.

"It is also interesting to note that, while situated in a region of positive space charge, the electrical polarization of Earth would have been considerably less than it is now. That, in turn, would cause a much lower gravitational force on Earth."[2]

This then led him to the following:

"The dinosaurs are reputed to have existed on Earth for a very long time so the lower gravity must have been due to the steady state of the Saturnian system before its break-up. If, as seems likely, the Saturnian system was not a part of our current solar system, then the Earth's electrical environment would have been quite different."[3]

A CHANGE IN MASS

The attenuated gravity we have envisioned to account for Earth's past gigantic life forms necessitated a change in mass. A change in mass, however, is not the same as the creation of matter out of nothing as required by the Big Bang theory, or out of some metaphysical medium as Carey and others have posited for their expanding Earth hypotheses. A change in mass does not require the creation of anything but only a shift in electrostatic potential. A change of mass in a cosmic body can be induced by a change in that body's electrical environment. This is so true that slight, but detectable, changes in Earth's mass continue to the present day. And while most astrophysicists are not yet ready to admit it, the reason behind these changes, slight though they may be at present, are intimately tied to spatial electric circuits. Wallace Thornhill expressed it best when he claimed that:

"All of the objects within the galaxy are connected by invisible electric circuits, detectable through their magnetic fields. So when a surge in local galactic current oc-

[1] W. Thornhill, "Planets, Stars, and Plasma Physics," *THOTH* I:1, electronic newsletter sponsored by KRONIA Communications (January 25, 1997), p. 9.

[2] *Idem*, "The Electric Saturnian System," *AEON* VI: 1 (February 2001), p. 43.

[3] *Idem*, on the electronic discussion group sponsored by KRONIA Communications, June 13, 1997.

> curs, the Sun becomes more active. When this happens, auroras and magnetic storms erupt above the surface of the Earth and weather patterns fail to conform to meteorologists' predictions. *Even the apparent mass and rotation of the Earth change slightly*, for there are no isolated islands in the electric universe."[1]

And this, naturally enough, still according to Thornhill, applies to the micro- as well as the macro-world. As he explained:

> "...we know from particle accelerator experiments that the mass of a particle of matter increases when subjected to acceleration in an electromagnetic field. So the internal electromagnetic state of a planet or a star may alter its apparent mass."[2]

It therefore becomes evident that Earth's mass would have changed—and much more than slightly—due (1) to proto-Saturn's theorized flare-up; and (2) to the changed electrical environment when the proto-Saturnian system entered the present Sun's domain of influence. As Thornhill surmises, "we have direct evidence in the form of megafauna that Earth's apparent mass, and therefore gravity, has changed." And: "That change seems to have been precipitated by a change in the Earth's electrical environment."[3] And while this transpired only once, previous proto-Saturnian flare-ups would also have ensued due to a change in similar differential electrical environments. As we had earlier presupposed, this could have been caused either by the proto-Saturnian system's transit from one plasma cell into another or through proto-Saturn's own intrinsic electrical behavior. It should, however, be noted that a passage through different plasma cells would hardly have resulted in a progressive increase in size all the way to the age of the dinosaurs, followed by a regressive decrease down into the Pleistocene. This would smack too much of a coincidental series of events. We must therefore conclude that the change in the proto-Saturnian system's electrical potential was actually inherent and that it was dictated by the evolutionary process of the sub-brown dwarf star that was proto-Saturn. In its turn, this cements our conviction that when the proto-Saturnian system's plasmasphere came in contact with the present Sun's heliosphere, proto-Saturn fell victim to a short-circuiting discharge that would have had a similar, if not an identical, effect.

Needless to say, any change in proto-Saturn's electrical potential would also have involved Earth. Under these conditions, both proto-Saturn and Earth would have gone through a change in mass and, therefore, a change in gravitational attraction.

OBJECTIONS RAISED AND OVERRULED

Philip Currie was right on target when he claimed that: "Almost every group that has evolved has tended to evolve giant forms."[4] But this, it is now being claimed, stems from the supposed fact that animals tend to grow bigger because larger ones have an easier time pro-

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[1] W. Thornhill & D. Talbott, *The Electric Universe* (Beaverton, Oregon, 2002), p. 46 (emphasis added).

[2] W. Thornhill to D. Cardona, private e-mail, June 22, 2004.

[3] *Idem*, on Intersect—electronic discussion group sponsored by KRONIA Communications, March 21, 2005.

[4] A. Ang, "Remains of Giant Dinosaur Found in China," *Associated Press* (June 13, 2007).

curing food while avoiding predators.[1] It does not seem to matter that this is contradicted by the survivability of those diminutive dinosaurs we have already discussed, to say nothing of the smallish mammals that coexisted with the megasaurs. Even the additional advantage the larger animals would have had in impressing potential mates, which has also been advanced in favor of nature's preference for gigantism,[2] fails to fill the bill because the penchant for size has only sexual meaning within the same family of animals. No female hippopotamus is going to be impressed by the larger stature of a male elephant.

When it comes to the dinosaurs' eventual disappearance, their very size was blamed in as much as the larger animals would have needed more food and a vaster territory from which to procure it. It is also claimed that they would have reproduced less frequently and would have had fewer offspring to carry on their line.[3] All of which, it has been said, would have rendered them "particularly vulnerable" when environmental conditions changed.[4] But, as we are finding out at present, all life, with the possible exception of mankind, is vulnerable when environmental conditions change. One must not forget that, with the disadvantages that size is supposed to have incurred on these truly gigantic beasts, they still managed to thrive for what we have been told to be millions of years.

It has also been claimed—at least by some—that dinosaurs in Earth's southern hemisphere "surpassed their northern counterparts in size."[5]

> "Why were southern dinosaurs so big [asks Shanti Menon]? Was it something in the water? 'We don't know,' says [Fernando] Novas. 'Maybe there was some climatic condition that allowed for these huge sizes. We don't know enough about the ecosystem'."[6]

The claim that southern dinosaurs were bigger was actually based on a comparison of the southern 26-foot long *Megaraptor*, the 42-foot long *Gigantosaurus*, and the 100-ton *Argentinosaurus*, with the smaller northern *Triceratops*, *Velociraptor*, and *Tyrannosaurus*.[7] But why compare them to those three? Why not compare the southern dinosaurs to the 50-foot long *Carcharodontosaurus* from the Sahara?[8]

One, of course, may counter with: How about the theorized 100-foot long titanosaurs from Argentina?[9] But then how about the 100-foot *Paralititan* from Egypt's Bahariya Oasis,[10] or the 157-foot long *Breviparopus*, from Morocco?[11]

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[1] *Ibid.*
[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*
[5] S. Menon, "King Claw," *Discover* (April 1998), p. 30.
[6] *Ibid.*
[7] *Ibid.*
[8] M. DiChristina, "The Dinosaur Hunter," *Popular Science* (September 1996), p. 42.
[9] J. Glausiuzz, "Secrets of Ancient Dinosaur Eggs," *Discover* (January 2002 Special Issue), p. 12.
[10] C. Rist, "A Giant Among Dinosaurs," in *ibid.*, p. 52.
[11] T. Holden, "The Sauropod Dilemma," *AEON* II:4 (May 1991), p. 117.

It is more than obvious that the claim that southern dinosaurs were bigger than northern ones is unfounded. One may even counter-claim that northern dinosaurs were bigger than southern ones? But even then, so what? Do we not find animals of different sizes scattered all over the world at present?

A more serious criticism may be geotropism—that is, the response of plants to gravity—also called the geotropic response. In this respect, experiments have supposedly shown that plants grow stunted in zero and low gravity. "Seedlings germinated at low effective gravities are often contorted and so have unnaturally high angularities." And: "A plant germinated in a low-gravity environment may have more problems than just a crooked stem." [1]

How does this fare against our claim that Earth's past flora stretched to towering heights due to a lesser gravity?

The first of the experiments in question was conducted by George Donald Graham in 1970 and repeated with a modified apparatus by his grandson, Shawn Carlson, in 1996. The apparatus consisted of a contraption in which corn seedlings in metal cans were aligned in a series of four horizontal shelves. One of these rows held the cans in an upright position, another held them at right angles to the vertical, while the other two held the cans at intermediate angles. The apparatus was constructed in a way that enabled the cans to rotate slowly in unison on their own vertical axis.[2]

The idea behind all this is that the rotating seedlings which were planted in cans at right angles to the vertical would experience zero gravity since "the specimen[s] would be unable to tell up from down." Those seedlings planted in rotating vertical cans would experience normal gravity. And those rotating at transitional angles would experience "an intermediate amount of gravity."[3]

I don't buy it.

Seeds scattered in zero gravity—had there been plants to scatter them in the first place—would remain perpetually airborne. Even those seeds which might temporarily hit the ground would not stay in situ long enough to be covered by dirt in order to germinate. Besides, our scenario has nothing to do with zero gravity.

And, in any case, the experiment does not really simulate zero, or a lesser, gravity. In the experiment described above, gravity continues to pull at the plants on different parts at different times, this way and that way, as they rotate. No wonder they grow stunted! In nature, plants do not rotate on their stems while forced to grow at an angle. In nature, no matter how low a gravity, they *will* be able to "tell up from down."

Besides, gravity is not the only source that "tells" a plant which way is up. Plants grow toward the available source of light. This is why certain flowers swivel on their stem while following the Sun's traverse across the sky. There is no mention of a light source, or what part this may have played, in the experiment in question. All that the experiment proves is that plants *do* stunt when *forced* to grow in an *artificial* set-up, such as the one described above. It has nothing to do with nature and even less with attenuated gravity.

[1] S. Carlson, "Geotropism, One Last Time," *Scientific American* (March 2001), pp. 78-79.

[2] *Ibid.*

[3] *Ibid.*

There is then the matter of Earth's past denser atmosphere which, as Frederic Jueneman and others have maintained, would have enabled giant pterodactyls to fly, thus overcoming the difficulty, if not impossibility, for them to have done so in an atmosphere like the present one.[1] A denser atmosphere, however, would not in itself have aided the attainment of the pterodactyls' gigantic size. Nor, as Mike Twose indicated, would it "help explain the massive creatures that lived underneath it."[2] Even so, as Jueneman himself admitted, his paper on the subject was not meant to "address any of the problems associated with these megafauna and their means of transportation."[3] As he also made clear, "postulating a more massive atmosphere in Earth's past explains some phenomena," but his reasoning "was by no means designed to be a theory of everything."[4] That Jueneman himself continued to think that the megasaurs would have been able to thrive under present gravitational conditions[5] is besides the point. But while we continue to disagree with him concerning the megasaurs' capability to thrive under present gravitational attraction, we *do* accept the postulate of Earth's past denser atmosphere as an additional boost in furthering prehistoric flight.

In view of the foregoing, our theory becomes quite simple. In agreement with Thornhill, we accept that Earth's gravity increased once the proto-Saturnian system's plasmasphere came in contact with the solar heliosphere. Proto-Saturn's flare-up would have been enough to change that body's electrical potential, and thus Earth's gravitational property. And this would then have been abetted by the proto-Saturnian system's entry into the Solar System and thus into the Sun's different electrical environment.

Thornhill, of course, relates the event to the time of the proto-Saturnian system's break-up. And while we do not disagree with this assessment, we will be showing in future volumes of this series that proto-Saturn's flare-up and the proto-Saturnian system's break-up were different events that were separated by something like 5,000 years.

As we have posited in an earlier work,[6] proto-Saturn's flare-up took place some 10,000 years ago at the end of the Pleistocene. The proto-Saturnian system's break-down would then have transpired some 5,000 years ago, which will now become our second bench-mark figure. It is thus not surprising that, as we have seen, 10,000 years ago was the approximate date supplied for the reduction of ancient man's former robust size, while a second reduction took place some 5,000 years ago. Moreover, as we have also noted, this reduction in size at the end of the Pleistocene affected not only man, but various other living creatures which, while not as large as the earlier dinosaurs, had been gigantic nonetheless.

What is remarkable in this instance is that the memory of the former stature of humankind was not lost on those who survived the Pleistocene disaster. During the time of the legendary Enosh, according to Jewish antiquities, "the ocean flooded a third part of the earth; there arose

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[1] *God Star*, pp. 345-348, 380, 385, and elsewhere in the present work.

[2] M. Twose, "Gravity and Pterodactyls," *AEON* V:4 (July 1999), p. 11.

[3] F. Jueneman, in reply to *ibid.*, p. 12.

[4] *Ibid.*; see also M. Twose and F. Jueneman, "Gravity and Pterodactyls: More Points to Consider," *AEON* V:6 (August 2000), pp. 7 ff.

[5] *Ibid.*, p. 10.

[6] *Flare Star*, pp. 341-342.

mountains, valleys, and rocky ground, whereas prior to that everything had been smooth and even." In this we recognize the diastrophism and the incursion of the ocean that transpired at the end of the Pleistocene Ice Age.[1] What is then added by the same Jewish sources is that, during this very same time, "*man's stature was shortened.*"[2]

True, as has been recently discovered, there were also bantam people in existence during the Pleistocene. I am here referring to the discovery of that mini human species on the Indonesian island of Flores that is reported to have thrived some 18,000 years ago.[3] Others have given a wider range covering the stretch from 70,000 to 12,000 years ago,[4] and later, by still others, from 95,000 to 13,000 years ago.[5] Barely three feet tall, these members of the *Homo* branch possessed brains roughly one-third the size of modern humans. Dubbed *Homo floresiensis*, or Flores Man, they were "not our ancestors but rather our evolutionary cousins."[6] Understandably, this gave rise to the usual controversies,[7] but further finds[8] and studies[9] clinched the case.

> "In spite of their downsized brains, the little people apparently had sophisticated technology. The fireplaces, charred bones, and thousands of stone tools we found among their remains must have been their handiwork, for we found no sign of modern humans. Stone points, probably once hafted onto spears, turned up among stegodont bones, some of which bore cut marks. The little hominins were apparently hunting the biggest animals around. It was surely a group activity—adult stegodonts, although dwarfed, still weighed more than 800 pounds, formidable prey for hunters the size of preschool children."[10]

What is of additional interest is that, very much as in the case of our more robust forebears, local traditional lore had long told of these diminutive people.[11]

I mention all this because it may be used as a careless criticism against our above hypothesis. Why would there have been such diminutive people at a time when terrestrial gravity was attenuated and thus conducive to exceptional growth? My answer to this question can only come in the form of another: Why not? Is it any different in today's world? The African continent itself is home to the tallest and shortest tribal groups on Earth. Although the height of

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[1] *Ibid.*, pp. 391 ff.

[2] L. Ginzberg, *The Legends of the Jews*, Vol. V (Philadelphia, 1968), p. 152 (emphasis added). NOTE: The subject of the Biblical giants mentioned in Genesis 6:4 is too ambiguous and controversial to be included here.

[3] K. Wong, "A Mini Human Species," *Scientific American* (December 2004), p. 34.

[4] H. Gee, "Meet Our New Relative: The Hobbit," *Focus* (January 2005), p. 69.

[5] M. Morwood, *et al.*, "The People Time Forgot," *National Geographic* (April 2005), p. 12.

[6] M. W. Robbins, "Little People Make Big Splash," *Discover* (January 2005), p. 31.

[7] K. Wong, "The Littlest Human," *Scientific American* (February 2005), pp. 56 ff.

[8] M. Morwood, *et al.*, *loc. cit.*

[9] "Brain Study Bolsters Case for Smart Bantam Human Species," *Scientific American* (May 2005), p. 10.

[10] M. Morwood, *et al.*, *loc. cit.*; See also H. Gee, *op. cit.*, pp. 68-69; K. Wong, *loc. cit.*; P. Andrews, "Choosing One's Relatives," *American scientist* (July-August 2007), pp. 354-355.

[11] M. Morwood, *et al.*, loc. *cit.*

the Watusi, also known as Batusi, is often exaggerated, they still form "the tallest grouping of mankind."[1] This African homeland is shared with the shortest people on Earth, the Efé Pygmies of the Ituri forest whose height averages four and a half feet, with the shortest Pygmy male on record just "a shade over three feet six inches tall."[2]

If such diversity in human height is possible under present gravitational attraction, what is so strange about a similar, or even greater, diversity in human robustness at a time when gravity acted with a lesser force on Earth? What should be stressed is that an attenuated gravity does not *demand* gigantic growth; it merely permits it. After all, even during the reign of the megasaurs, the land was shared with pygmy dinosaurs, some no bigger than a chicken.

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[1] M. J. Herskovits, "Negro," *Encyclopaedia Britannica* (1959 edition), Vol. 16, p. 193.

[2] J-P Hallet (with A. Pelle), *Pygmy Kitabu* (N. Y., 1973), p. 3.

Chapter 7

Sudden Violence

SURVIVAL OF THE FORTUNATE

The dinosaurs "may have been among nature's most exquisitely adapted creatures," wrote Fred Warshofsky. "After all, they were the dominant life form on earth for 135 million years and displayed a diversity of form and function that was absolutely dazzling in its multiple adaptations."[1] They were definitely better adapted to a wider environmental range than many other creatures who both preceded and followed them. As Carl Zimmer more recently emphasized, "once dinosaurs emerged into this bustling world, they became the dominant herbivores and predators."[2] But if, as per Charles Darwin, the evolution of life-forms depends on natural selection through the survival of the fittest, why, then, did the dinosaurs not survive?

The answer to that question is very simple: Fitness has nothing to do with survival. George Gaylord Simpson buried this regrettable dictum when he showed that, while some early life-forms became more specialized, the majority of them became extinct. On the other hand, in quite a few number of cases, those life-forms that were the least specialized in their time survived the longest.[3]

Let not this blunder be laid directly at Darwin's door. It is often easily forgotten, even among scholars, that Darwin's own work on evolution consisted of two entirely separate aspects: (1) the establishment of evolution as a fact of nature, and (2) the mechanism responsible for evolutionary change. And while he was absolutely confident about the first, he was never quite certain about the second. In fact, as Stephen Jay Gould pointed out, Darwin expressed "appropriate caution about his unproved theory of natural selection."[4] Besides, Darwin was not the first to propose evolutionary change through this process. Some years before Darwin, and independently of each other, both William Wells and Patrick Matthew, now both almost forgotten, had also advocated natural selection.[5]

What *is* unfortunate is that some notable supporters of Darwin, especially in England, such as Thomas Huxley and Alfred Russel Wallace, accepted natural selection as sacrosanct and

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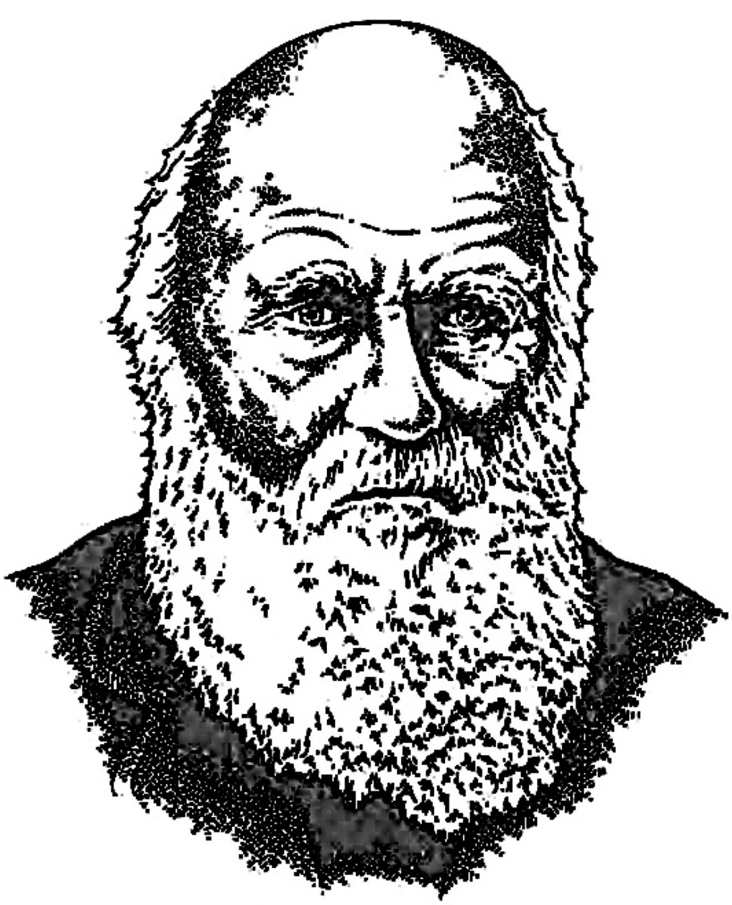
[1] F. Warshofsky, *Doomsday: The Science of Catastrophe* (N. Y., 1977), pp. 194-195.
[2] C. Zimmer, "Dinosaurs," *Discover* (April 2005), p. 33.
[3] G. Gaylord Simpson, *Splendid Isolation* (Yale, 1980), reviewed by J. Abery, *SIS Workshop* 4:1 (July 1981), pp. 28, 30.
[4] S. J. Gould, "Darwinism Defined: The Difference Between Fact and Theory," *Discover* (January 1987), p. 64; see also, T. Palmer, "Towards a New Evolutionary Synthesis," *Chronology and Catastrophism Review* XI: (1989), p. 6.
[5] *Ibid.*, p. 7.


Charles Darwin—(1809-1892)—who himself advocated caution concerning the acceptance of natural selection. (Illustration by Charles Hogarth.)

fought off tooth and nail all those who sought to criticize it. And criticized it was—no, actually rejected—by almost all scholars for the first seventy-five years following the publication of *The Origin of Species*, as it continues to be at present by an ever growing number of evolutionists.[1] Take for instance Michael Benton, at the time hailing from the University of Oxford, when he wrote that:

> "New analyses suggest that the classical view, that some groups die out simply because they become 'out of date' and are replaced by their more efficient competitors over long periods of time, is not an adequate explanation. There is increasing evidence that major physical changes have caused more large-scale evolutionary changes than has competition."[2]

The dinosaurs could not have succumbed due to their having been unfit. As the editors of *Discover* stressed:

> "Long ago, when dinosaurs ruled the land, mammals were nothing but miserable creatures scrambling in the underbrush. The fact that mammals survived and dinosaurs didn't indicates nothing about how well adapted each was to the environment. Rather, says University of Chicago paleontologist David Jablonski, the dinosaurs died out because the rules of survival under which they had thrived 'were called off'."[3]

It is therefore clear that whatever snuffed out the dinosaurs would either had to have been a vagary of nature (that is an unfortunate accident), or something inherent in nature itself

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[1] See for instance, *Scientific American* (February 2000), pp. 72-77; *Science Frontiers* (May-June 2000), p. 3; S. A. Kauffman, *The Origins of Order: Self-Organization and Selection in Evolution* (Oxford), *in toto*.
[2] M. J. Benton, "Large-Scale Replacements in the History of Life," *Nature* (March 3, 1983), pp. 16-17.
[3] "Mass Extinctions as Prehistoric Lotteries," *Discover* (April 1986), p. 9.

(which would have spelt inevitability). It then becomes obvious that those life forms which *did* survive were merely fortunate.

ERADICATION OF THE HAPLESS

The amount of life forms that have thrived on Earth in its past ages are unimaginable. With new fossil discoveries just about every year, no one knows their true quantity. Time and again, however, untold numbers of these life forms were wiped out in unison. As Trevor Palmer succinctly phrased it, "it has been known for many years that several mass extinctions have occurred since life first appeared on Earth, i.e. there have been several occasions when many species became extinct *at more or less the same time*."[1] Carl Sagan, too, explained it quite clearly when he wrote that:

> "[Earth's] rocks are trying to tell us something. [F]ossils are the only remains of creatures that once strode or slithered or swam or just took root, beings that arose and died out long before there were any humans to take note of them. You take a particular fossil and, *all over the world*, there is a layer—corresponding to some epoch in the past—below which that organism had not yet come into being. Generally, there is a layer above, in which that fossil no longer appears; but the fossils of new organisms are there found for the first time. The lesson is clear: Great number of species have become extinct, providing opportunities for other species to evolve and fill the vacated ecological niches...You count up all the beings that leave fossils and you discover that the vast majority by far of all species that ever lived are now extinct. *Extinction is the rule. Survival is the exception.*"[2]

Seventy-three percent of all large mammals in North America, as well as 80 percent of those in South America, disappeared at the end of the Pleistocene.[3] What is worse is that, unlike previous epochs, the disappearing species were never replaced by new ones.[4] More drastic still is that 98 percent of *all* past life forms that we presently know of have been eradicated through Earth's past history.[5]

> "...one should in fairness realize that long before man's advent, major animal species were regularly wiped out by the play of natural forces. Paleontologists have concluded that today's animals represent only 2 percent of the half-billion species thought to have existed during the earth's history."[6]

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[1] T. Palmer, "The Cautious Revolutionary," *Chronology & Catastrophism Review* IX (1987), p. 46 (emphasis added).

[2] C. Sagan & A. Druyan, *Comet* (N. Y., 1985), pp. 272-273 (emphasis added).

[3] T. W. Field, "Evidence of an Inversion Event?" *AEON* II:1 (1989), p. 9.

[4] *Ibid.*, p. 11.

[5] H. Bowser, "Vanished!" *Science Digest* (July 1982), p. 49.

[6] *Ibid.*, p. 50.

As various geologists and palaeontologists have long noted, contrary to the credo that was shared by both Lyell and Darwin, transitions in Earth's past history have been anything but gradual. "Ever since the time of Georges Cuvier," wrote Palmer, "it has been apparent that the evidence of Earth's rocks is not in accord with a smooth, gradual and even-paced development of organisms of increasing complexity; rather it speaks of abrupt changes of environment, of extinctions and of repopulations with new species."[1]

> "Moreover, the evolutionary record shows that there have been short periods of geological time when many species have died out together ("mass extinctions") and others where many new species have suddenly appeared, apparently from a common stock ("explosions" or "radiations"). Further, the two types of event are linked, the explosions of new species seemingly being a response to the vacating of many ecological niches by mass extinctions."[2]

As the editors of *Discover* put it:

> "During normal times a species that's diverse and ranges over a whole continent is likely to thrive. But during a mass extinction such a species is just as likely to die out as a very provincial one. A mass extinction affects not individual species but clades, groups of species that share a common lineage."[3]

And this, David Jablonski stresses, indicates that mass extinctions had to have been truly global in their effect.[4] "Moreover, this global event throws a wrench in the works of evolution," the editors in question conclude. "Groups that were successful are lost, and others take their places."[5]

> "Surviving a mass extinction—in which large number of species from many different habitats die out in a geologically brief time—is a lottery. No matter how remarkable a creature is, there's no guarantee it has what's required."[6]

In other words, those life forms that succumbed were merely victims of misfortune.

THE CRETACEOUS-TERTIARY BOUNDARY

Roughly speaking—but only roughly speaking—the reign of the dinosaurs came to an end at the boundary that separated the Cretaceous from the Tertiary period anywhere from 63 to 66 million years ago depending on which authority one consults. Some palaeontologists refer to this division as the C-T boundary. But most of them prefer the label K-T boundary since the letter "C" had already been appropriated for the Carboniferous period. The preferred "K"

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[1] T. Palmer, "Catastrophism and Evolution," *S.I.S. Review* VII, Part A (1985), p. 10.

[2] *Ibid.*, p. 13.

[3] "Mass Extinction as Prehistoric Lotteries," *Discover* (April 1986), p. 9.

[4] *Ibid.*

[5] *Ibid.*

[6] *Ibid.*

stands for the Greek *kreta*, which means "chalk," since the world-wide Cretaceous strata is chock full of chalky limestone. In what follows, designations will be used as supplied by those quoted.

It should be noted that it is not known for certain what interval of time is covered by the interim represented by the boundary. Authorities differ greatly on this. Some will say that it is somewhat less than one million years. Others narrow it down to less than 100,000 years.[1]

The demise of the dinosaurs had for long mystified experts in the field. "How long the process took is still open to doubt," wrote Francis Hitching, "perhaps a few hundred thousand years, but more likely a much shorter time, and possibly only a few days."[2]

That the beasts succumbed in "only a few days" would be highly stretching it. Hitching was on safer ground in describing the event as having occurred "in an eye-blink" when compared to the dinosaurs' length of reign. He was also quite correct in making clear that the "devastation struck at almost all forms of life, simultaneously annihilating many mammals, reptiles, shellfish, and plants."[3] And this should be stressed because, while they have been made to hold center stage in this end-of-the-line adversity, the dinosaurs were not its only victims. It has been calculated that over 75 per cent of all Cretaceous species failed to make it into the following Tertiary period.[4] Others vouched for up to 80 percent.[5] Not only animals, but many land plants became extinct during the same period.[6] Moreover, the winnowing of life seems to have favored those of robust body since "no land vertebrate over 25 kg weight is known to have survived into the Tertiary."[7] This was accentuated by Trevor Palmer when he claimed that the mammals which superceded the dinosaurs survived simply because they were small.[8] Land vertebrates aside, some clams and snails also died out at the same time.[9]

It has been argued by some that even the extinction of vertebrates across the Cretaceous-Tertiary boundary was not as massive as is often supposed.[10] This, however, depends on how one looks at the problem, to say nothing of who is doing the looking. Those who stand by this assertion claim to do so by weighing the number of life forms that managed to survive against the number of those that did not. While he does not single them out to the exclusion of other life forms, J. David Archibald points mainly to mammals as the survivors.[11] Edwin Dobb includes crocodiles, turtles, and birds.[12] As Archibald stresses, however, all "nonavian dino-

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[1] J. D. Archibald, *Dinosaur Extinction and the End of an Era* (N. Y., 1996), p. 176.

[2] F. Hitching, *The World Atlas of Mysteries* (London, 1979), p. 10.

[3] *Ibid.*

[4] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 106.

[5] D. M. Raup, "Changing Views of Natural Catastrophe," *The Great Ideas Today* (Chicago, 1988), p. 73; R. Gore, "Extinctions," *National Geographic* (June 1989), p. 664.

[6] *Nature* (November 13, 1986), p. 112.

[7] V. Clube & B. Napier, *loc. cit.*

[8] P. J. James, *et al.*, "Global Catastrophes: New Evidence from Astronomy, Biology and Archaeology," *S.I.S. Review* VI:4 (1981/82), p. 91.

[9] "Mass Extinctions as Prehistoric Lotteries," *Discover* (April 1986), p. 9.

[10] J. D. Archibald, *op. cit.*, p. 124.

[11] *Ibid.*, p. 125.

[12] E. Dobb, "What Wiped Out the Dinosaurs?" *Discover* (June 2002), p. 40.

saurs" suffered what he prefers to call an "apparent extinction."[1] Despite some hair splitting, why only "apparent" is not very well clarified.

Richard Fortey was closer to the mark when he stressed that it is evidence—"hard facts"—that has to be "collected from the rocks, one rock bed after another, in order to find out what happened at the end of the Cretaceous."[2]

> "There are problems [he went on]. In many rock sections there is a break in the rock record at exactly the time of extinction: you can see the world before and the world after—but not the critical moments. It is like losing a few frames from the print of a whodunnit; one moment the victim is alive, the next he is dead, but the critical frames featuring the criminal and the smoking gun have vanished."[3]

And yet, as he goes on, what does lie concealed in these very rocks is "extraordinarily interesting."[4] Speaking of the "pattern" found in the rock strata in question at places as far afield as Gubbio in Italy, Tunisia in North Africa, Mexico, and even Antarctica, he could state that:

> "The first striking fact is the sharpness of the change between Cretaceous and Tertiary. Few species of fossils, large or small, pass straight though the K-T boundary. Ammonites disappear, never to return, and there are extinctions in other marine animals, too, even if their families did not become extinct as a whole. So sharp is the change that it is possible to put your finger on the exact boundary..."[5]

As with others before him, this led Fortey to the assumption that "whatever caused the change, it operated fast," even though, as we shall see, it continues to be argued "exactly *how* fast."[6]

CATASTROPHISM WINS THE DAY

Forget the worn-out excuse of missing geological strata. Logic alone should tell us that the same stratum could not be missing all over the world. There is no stratum missing between the Cretaceous and Tertiary layers. The sharpness of the change between the one stratum and the other that Fortey speaks of indicate a sudden change. But what does "sudden" really mean?

> "To a geologist [Peter Warlow tells us], the use of the word 'sudden', or even of the word 'catastrophic', is quite acceptable when dealing with a period of a million years,

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[1] J. D. Archibald, *loc. cit.*

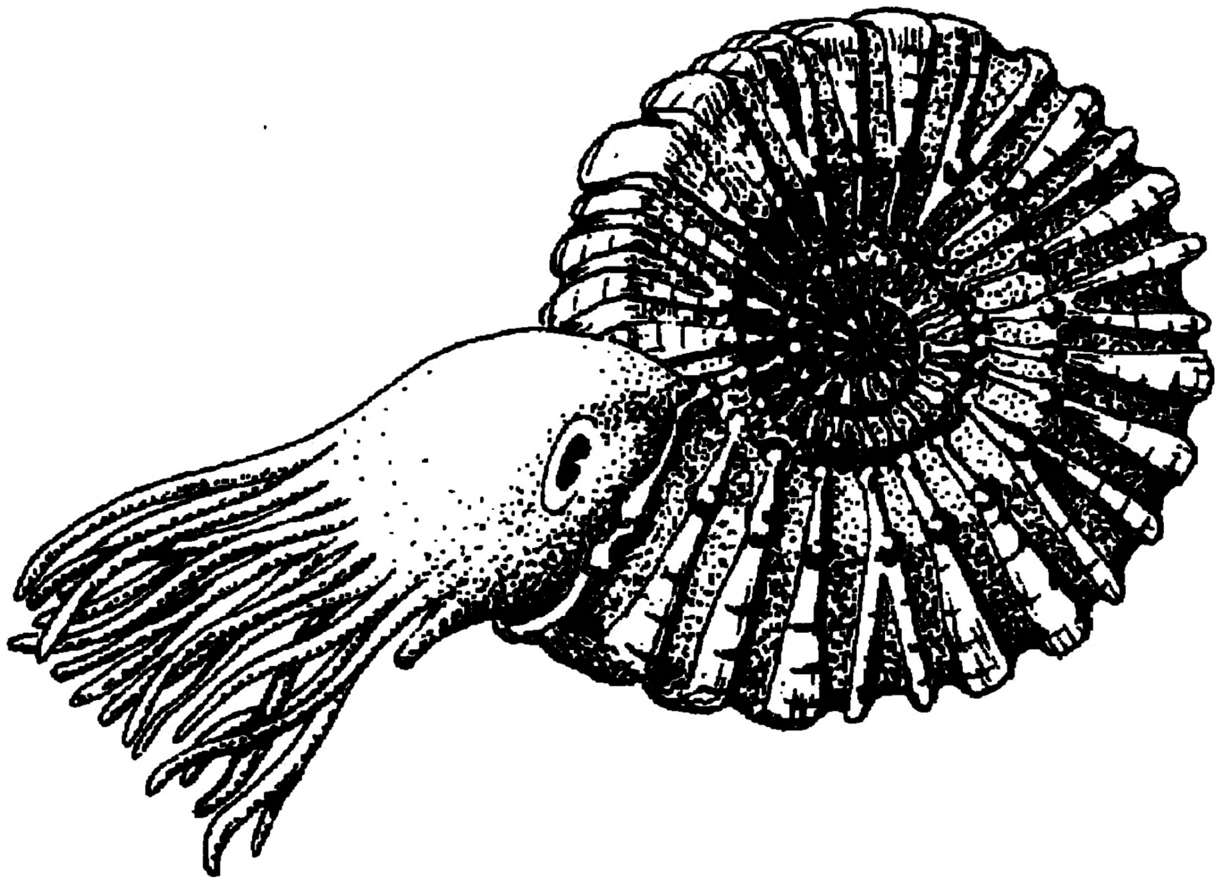
[2] R. Fortey, *Life: A Natural History of the First Four Billion Years of Life on Earth* (N. Y., 1998), p. 241.

[3] *Ibid.*, pp. 241-242.

[4] *Ibid.*, p. 243.

[5] *Ibid.*

[6] *Ibid.* (emphasis added).



Ammonites, like the one shown above, disappeared at the Cretaceous-Tertiary boundary never to return.

for the overall time scale is measured in many tens of hundreds of millions of years...However, as [Adrian] Desmond points out, there are some geologists and others who consider that the event occurred in a time very much less than a million years. He mentions one member of the Scripps Institute of Oceanography, whose studies of the massive destruction of plankton lead him to suggest a time scale of only a few thousand years, and there are other investigators who consider that a few *days* would be sufficient. The common meanings of the words 'sudden' and 'catastrophic' would be applicable in such cases—and we are not talking here of the 'fringe' and 'crank' scientists, who do also make such claims."[1]

That this sudden change was violent is implied by the concentrations of broken and jumbled dinosaur bones that have been discovered far and wide. And this has been known since not long after the discovery of dinosaur skeletons began in earnest. "These reptiles," meaning dinosaurs, wrote J. A. Allan, "whose fossil remains are found in such great

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[1] P. Warlow, *The Reversing Earth* (London, 1982), p. 89 (emphasis as given).

abundance along the Red Deer [River] seem to have been driven together by a common danger and to have perished in the same great catastrophe."[1]

One explanation that has been given for this profusion of fossils is that dead dinosaurs floated downstream where they became trapped and buried in the delta's muck.[2] "It looks like a catastrophe," reported Philip Currie.[3]

> "We think a herd was trying to cross a river in flood. These animals weren't too bright."[4]

One can easily see these not "too bright" beasts surviving for the millions of years they are believed to have done! But leave that alone.

Up until 1981, the quantities of these dinosaur fossils along the Red Deer River were regarded as "unmatched anywhere else in the world."[5] When one realizes that these dinosaur bone-beds extend "over an area thousands of meters square,"[6] one begins to wonder why so many dinosaurs would have attempted to cross a flooding river in the first place. As it has been reported: "The thoroughly mixed fossils are often so dense that it is difficult to walk over the area without stepping on specimens."[7] In fact, as Currie himself commented:

> "We strongly suspect that each bone bed represents the demise of a single herd of dinosaurs in a common disaster, such as a flash flood or an epidemic. The shallowness of the bedding planes and their uniform composition pretty much exclude the possibility that the bone beds accumulated over longer stretches of time."[8]

Flash floods, however, cannot be blamed on similar concentrations of dinosaur bones from other geographical areas—or ammonites and plants. (Or did ammonites also get trapped in torrential floods?) And yet, even there, the signs of sudden death remain quite obvious. Thus, for instance, further abruptness of death is indicated by a hoard of *Quetzalcoatlus* pterosaurs in western Texas which were found in one area "where it appears that all the animals died over a short span of time." This short span was reported to have been "perhaps only a few years."[9] But for such a hoard of flying reptiles to have succumbed in the same place over a few years would be stretching it a bit. It is more likely that they all died at the same time.

A similar dinosaur bone bed was discovered on the other side of the world in China's Yunnan Province. Reported as obviously being the "site of mass death," this extermination has also been blamed on a probable flood.[10]

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[1] J. A. Allan, "Geology," *Province of Alberta, Research Council of Alberta, Report* No. 34 (Edmonton, 1943).

[2] G. Olshevsky, "Dinosaur Renaissance," *Science Digest* (August 1981), p. 43.

[3] R. Gore, "Dinosaurs," *National Geographic* (January 1993), p. 46.

[4] *Ibid.*

[5] G. Olshevsky, *loc. cit.*

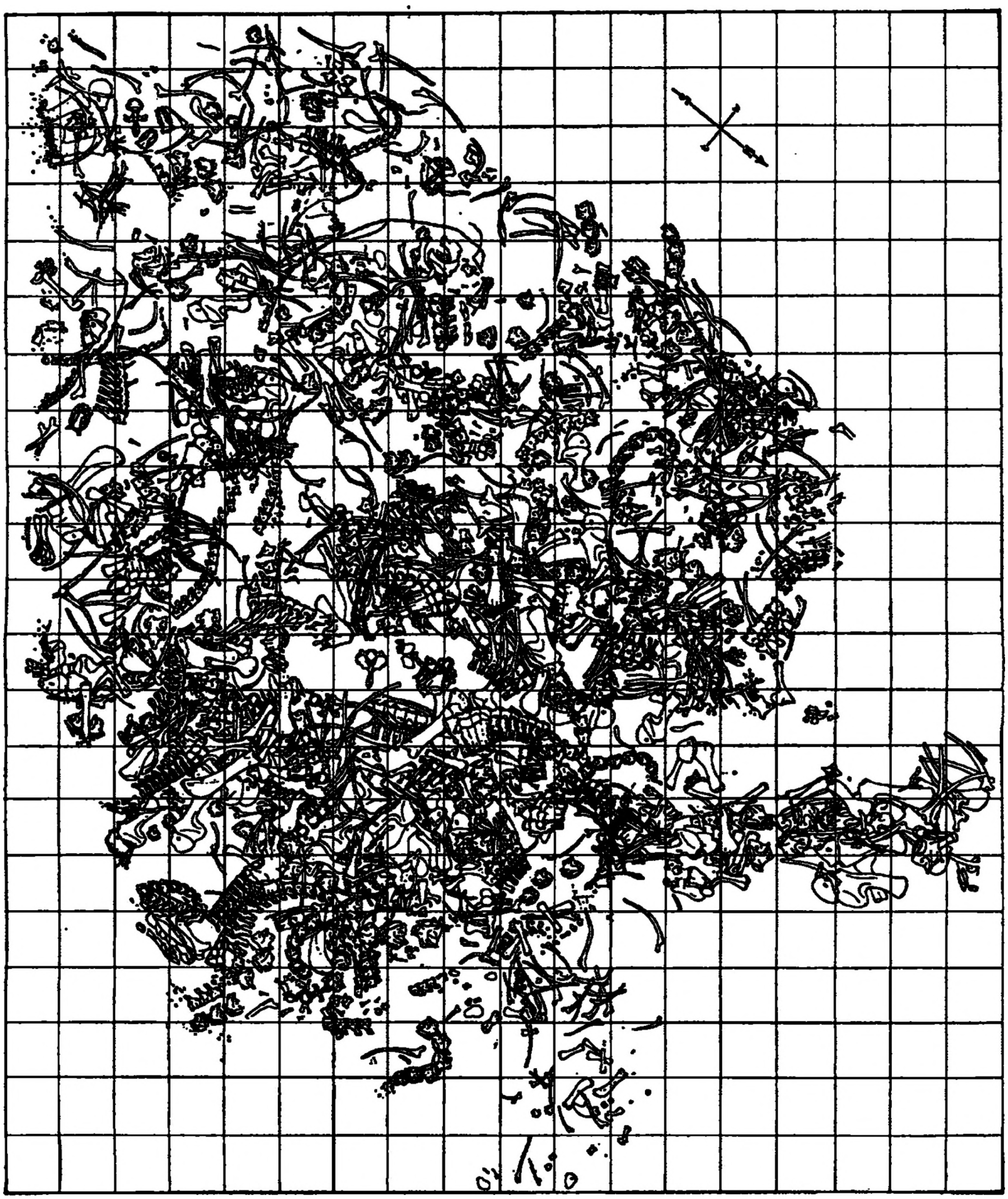
[6] *Ibid.*

[7] *Ibid.*

[8] *Ibid.*

[9] W. Langston, Jr., "Pterosaurs," *Scientific American* (February 1981), p. 126.

[10] R. Gore, *op. cit.*, pp. 24, 26.



Concentration of dinosaur bones excavated at Howe Quarry in Wyoming.
(Illustration courtesy of the American Museum of Natural History.)

Another extensive dinosaur boneyard showing clear indications of a catastrophic termination comes from farther north in the Gobi Desert. Because the expedition which discovered it was assailed by sand storms, Michael Novacek concluded that similar sand storms would have been the cause behind the dinosaurs' demise.[1] As if the dinosaurs could have maintained an existence in a land that was already one of the driest deserts on Earth for there to have been sand storms waiting to end their life!

Pteranodons have been found with the fossil remains of fish impressed in their pelican-like pouches, indicating that they died before they could as much as swallow, let alone digest, their last meal.[2]

We have already noted, on an earlier page, that tangle of yard-long *Maiasaur* baby sibling skeletons that was discovered in an eroded Montana rangeland by Robert Makela in 1978. As Jack Horner then inferred, the youngsters had apparently remained in or near their eggshell-littered nest for many months since their teeth were already extensively worn, the implication being that food had been brought to them on a regular basis. These fifteen baby dinosaurs "may have been awaiting the return of their huge mother from a foraging expedition when catastrophe overtook their nest at the eastern edge of the Rocky Mountains."[3]

In northern New Mexico, hundreds of skeletons belonging to *Coelophysis* were found so closely packed together that they have been described "as if they had perished in some calamity."[4]

"An *Oviraptor* was found, fossilized, still squatting over its nest of eggs, in the same sitting pose as that of a present-day ostrich."[5] And the verdict? "It had been overwhelmed by a violent storm, but loyally stayed by its twenty-two eggs—the very model of maternal devotion."[6] Others, who claim the eggs numbered 34, blame the collapse of their burrow or a sudden flood.[7] It is not stated how this creature remained in its maternal posture long after death to become fossilized in that position.

P. R. Wilby, *et al.*, have however indicated that fossils do not necessarily take as long to form as previously assumed. Their take is that when bacteria in a dead body form apatite, which is a form of calcium phosphate from which bones are composed, mineralization occurs at the subcellular, microscopic level. "Laboratory experiments show that the mineralization of soft tissues in apatite occurs within two to four weeks after death."[8] While this process has not yet met with general scientific approval, one is still bound to argue: Never mind the *Oviraptor* mother mentioned above—but with the millions of fossilized beasts in the world, can it be considered probable that scavengers would have failed to take advantage of entire herds of

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[1] J. Adler & A. Rogers, "The Great Boneyard of the Gobi," *Newsweek* (June 5, 1995).

[2] W. Langston, Jr., *op. cit.*, p. 135.

[3] M. W. Browne, "New Find Sharpens Great Dinosaur 'War'," *Ottawa Journal* (April 12, 1980).

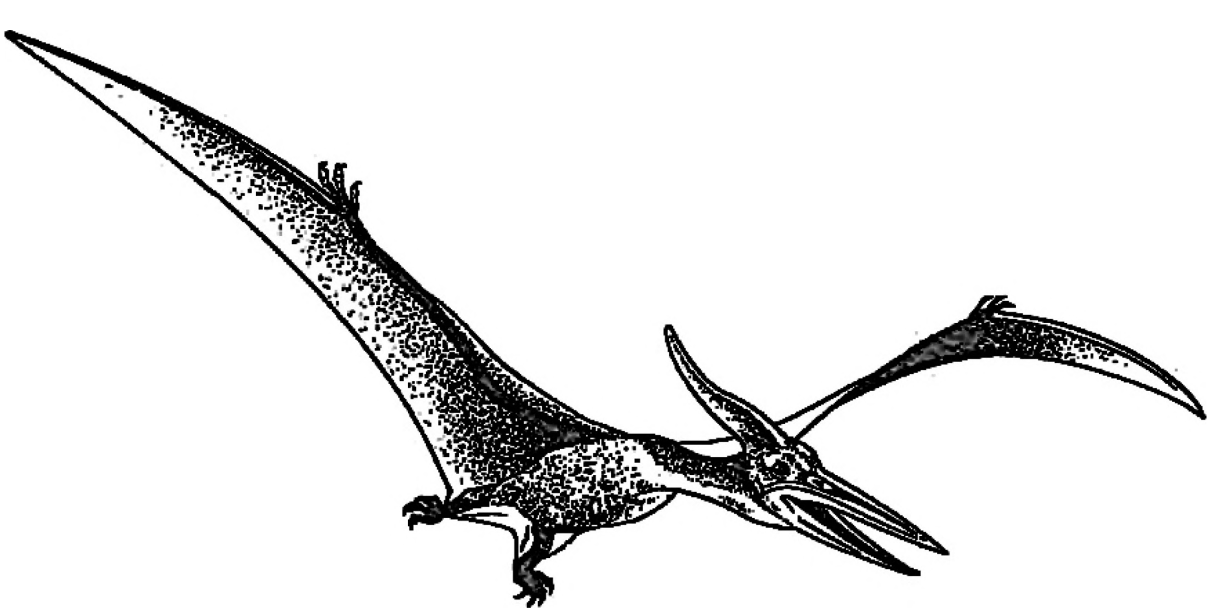
[4] R. Gore, *op. cit.*, p. 14.

[5] R. Fortey, *op. cit.*, p. 225.

[6] *Ibid.*

[7] J. F. Netting, "There's Nothing Like a (Dinosaur) Mother's Love," *Discover* (December 2004), p. 10.

[8] P. R. Wilby, *et al.*, "Mineralization of Soft-Bodied Invertebrates in a Jurassic Metalliferous Deposit," *Geology* (September 1996), p. 849.



Pteranodon, members of which have been found with fossil fish impressions in their pouches, indicating that they died before they could swallow, let alone digest, their last meal.
(Illustration by Bob Giuliani.)

dead animals during the minimal two weeks needed for fossilization? And what then about fossilized trees? It is not that I doubt that fossilization occurred much faster than currently believed, but I *do* very much doubt that bacteria had anything to do with it.

And then there is *Mei long*—"soundly sleeping dragon"—the remains of which were found in the Liaoning Province of China. This duck-sized dinosaur "apparently died while it napped." It's face was still nestled behind one forelimb "which resembles a wing except for the long, clawed fingers at the end." It looked "amazingly like the tucked-in nighttime repose of modern birds." It was preserved "in exquisite three-dimensional detail." Mark Norell is of the opinion that "poisonous gases from a volcanic eruption asphyxiated the dinosaur, then quickly buried it under a blanket of fine ash." Moreover, the region in which it was discovered "has yielded several other specimens that similarly show signs of rapid burial."[1] In fact, among the thousands of specimens that have been discovered in the Liaoning strata, many are often found embedded in the same slab, a condition which Norell interprets as "a sure sign of catastrophe."[2]

Discoveries of catastrophically entombed dinosaurs continued into the twenty-first century. One such boneyard came to light in Alaska, disclosing a herd of *Pachyrhinosaurus* that

[1] J. F. Netting, "Meet Mei Long, the Sleeping Dragon," *Discover* (January 2005 special edition), p. 10.
[2] M. Norell, "The Dragons of Liaoning," *Discover* (June 2005), p. 63; C. Turpy, "China's Extraordinary Fossil Site: Jewels in the Ash," *National Geographic* (August 2005), p. 97.

"had probably died together in a flood or other catastrophe."[1] Herds of *Edmontosaurus* were also "found in piles in various places in northern Alaska as though groups of them had died in a flash flood."[2] All of which tends to make one believe that dinosaurs seem to have had a propensity for succumbing to flash floods—even their eggs, or so it seems. Dinosaur eggs from Argentina have also been theorized to have been buried by floods, following which, it is said, they fossilized extremely fast.[3] Such floods continue to happen to this day, but how often do we hear of entire herds of animals being washed away by them? And of those few unlucky individuals that do succumb to such torrents to be buried by their sediments, how many of them end up being fossilized? Bill Bryson was right on the mark when he stated that:

> "It isn't easy to become a fossil. The fate of nearly all living organisms—over 99.9 percent of them—is to compost down to nothingness...Most of what has lived on Earth has left behind no record at all."[4]

In the end, whether through scientific logic or general acceptance, and despite some dissenting voices, the catastrophic extinction of the dinosaurs won the day.

> "According to the latter-day catastrophists [Adrian Desmond had even earlier observed], the dinosaurs exited with the most spectacular bang since Creation, and, the geologist's lingering aversion to cataclysms notwithstanding, it is becoming difficult to disagree...whatever racked the planet 70 million years ago brought to an abrupt end the Mesozoic world order [of which the Cretaceous formed the last period] and closed a major chapter of earth history...The magnitude of the devastation cannot be underestimated...Whatever the nature of the event that we are dealing with, it was of catastrophic proportions."[5]

So, likewise, Robert Jastrow who, in 1983, could afford to be bold enough to write: "The suddenness of [the dinosaurs'[disappearance suggests that they were wiped out by some natural disaster."[6]

Need I even say it?—not everyone agreed. The paleobotanist Leo Hickey, for instance, pointed out that while many kinds of plants became extinct *around* the same time, their disappearance was gradual, "persisting over millions of years," and they did so at different times in different places. And not only plants, but animals, including dinosaurs, as well.[7]

J. David Archibald was of an entirely different opinion. "Of all the data from the terrestrial realm," he claims, "the record of plants in the Western interior seems to me to present the strongest case that extinction was rapid, not gradual, for the species so affected."[8]

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[1] A. R. Fiorillo, "The Dinosaurs of Arctic Alaska," *Scientific American* (December 2004), p. 85.

[2] *Ibid.*, p. 86.

[3] *New Scientist* (March 19, 2005), p. 18.

[4] B. Bryson, *A Short History of Nearly Everything* (Canada, 2004), pp. 321, 322.

[5] A. J. Desmond, *The Hot-Blooded Dinosaurs* (N. Y., 1976), pp. 195-196.

[6] R. Jastrow, "The Dinosaur Massacre: A Double-Barreled Mystery," *Science Digest* (September 1983), p. 51.

[7] *Ibid.*, p. 52.

[8] J. D. Archibald, *op. cit.*, p. 180.

But even he remained somewhat undecided. "It would be logically and scientifically invalid, however, to simply extend this conclusion of rapid extinction to all species in the terrestrial realm," he went on, "especially if the animal record is not clear one way or the other (as I maintain it is not)."[1] And: "We have no reliable evidence for the *rate* of vertebrate extinctions at the K/T boundary, by which we might determine whether the die-off was abrupt or gradual."[2] One would like to know how it can be possible for the plants of a specific period to have been brought rapidly to extinction, which could only mean catastrophically, while leaving the vertebrates that fed on them virtually unscathed.

David Raup, too, was still undecided up till 1988:

> "Catastrophic interpretations of features in Earth history are viewed as guilty until proved innocent [he wrote]. In this sense the original Lyellian view has not changed much since the mid-nineteenth century...We do not know whether the extinctions were instantaneous or spread over a considerable time, because geologic dating is not accurate enough to make that distinction."[3]

But then he was honest enough to claim that "scientists have traditionally erred by downplaying the role of rare, catastrophic events."[4] Even so, wavering between the old paradigm and the new, he could not help but add that "it is also conceivable that the new interest in catastrophe to explain natural systems is misguided."[5] In view of this he cited the syndicated columnist Ellen Goodman who had suggested that scientific theories often reflect the attitudes and concerns prevalent at the time. Focussing on warnings of nuclear winter, global pollution, and the likes, she was of the opinion that these fears may be responsible for the current shift toward catastrophism. She thus wondered whether "every era gets the dinosaur story it deserves."[6] She seems not to have known that the recognition of Earth's catastrophic scars date from well before the fears of which she speaks had come into vogue.

And yet one cannot help admitting that there *is* a psychological factor involved when it comes to the acceptance or otherwise of the catastrophic termination of life. Stephen Jay Gould, the dean of punctuated equilibrium, drove this point home when he wrote that:

> "Something about catastrophism rubs many people the wrong way, and rubs a lot harder than most other irreverences. Perhaps the largest lesson lies right here. What are we afraid of? What [is it] about our training and cultural heritage [that] makes such plausible theories seem so troubling? The universe is too damned complex to permit us the luxury of dogmatism if we have any honest desire to comprehend it"[7]

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[1] *Ibid.*

[2] *Ibid.*, p. 203 (emphasis as given).

[3] D. M. Raup, "*op. cit.*, p. 72.

[4] *Ibid.*, pp. 76-77.

[5] *Ibid.*, p. 77.

[6] E. Goodman, "A Dinosaur Theory Tailored for Our Times," *Boston Globe* (January 3, 1984).

[7] S. J. Gould, "All the News that's Fit to Print and Some Opinions that Aren't," *Discover* (November 1985), p. 91.

To be sure, Gould did not entirely abandon gradualism. "Gradualistic change has not been abolished and never shall be," he maintained, "because modes of change are many on our complex Earth, and some are genuinely slow and steady."[1]

> "But the hegemony of gradualism as the only scientifically acceptable style of change [he went on] has been broken. A substantial, *perhaps a dominant*, component of geologic and biological change may well have occurred in the catastrophic mode."[2]

Same as with the trilobites of the Cambrian which became extinct during the Permian. "As with all extinct creatures," wrote Bill Bryson, "there is a natural temptation to regard them as failures, but in fact they were among the most successful animals ever to live."[3]

Eventually, even Carl Sagan, that indomitable foe of catastrophism, stepped away from his astronomical discipline to join the ranks of catastrophist palaeontologists. "The Cretaceous catastrophe," he wrote, "wiped out every family, every genus, and every species of dinosaur [despite the fact that] they were as varied and successful as the mammals are today."[4]

> "All the flying and swimming reptiles died as well [he went on], and more than a hundred families of beings that live in the oceans. It was a catastrophe enormously beyond anything humans have ever known, at least so far."[5]

Echoing *Discover*'s 1986 editorial,[6] Bryson was reasonably succinct when he stated that: "Evolutionary success, it appeared, was a lottery."[7]

PROPOSED CAUSES

"The number of theories put forward to account for [the demise of the dinosaurs] is almost as great as the number of people who have tackled the problem," wrote Peter Warlow.[8] Trevor Palmer opted for "over fifty different terrestrial explanations" which have been proposed to account for the extinctions.[9]

> "These have included species senility [he went on]; the cooling of the oceans by water flowing from a presumed Arctic lake; the development by mammals of a taste for dinosaurs' eggs; the poisoning of dinosaurs by alkaloids in flowering plants, which first appeared during the Cretaceous Period (but some 50 Myr before its end); the di-

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[1] *Idem*, "An Asteroid to Die For," *Discover* (October 1989), p. 62.

[2] *Ibid.* (emphasis added).

[3] B. Bryson, *op. cit.*, p. 323.

[4] C. Sagan & A. Druyan, *op. cit.*, p. 275.

[5] *Ibid.*

[6] "Mass Extinction as Prehistoric Lotteries," *Discover* (April 1986), p. 9.

[7] B. Bryson, *op. cit.*, p. 327.

[8] P. Warlow, *op. cit.*, p. 88.

[9] T. Palmer, *Catastrophism, Neocatastrophism and Evolution* (Nottignham, 1992), p. 49.

nosaurs going blind (perhaps because of increased solar radiation); and climatic changes, which may have affected sex ratios amongst dinosaurs."[1]

To the above list one can also add the following, all of which have been proposed at one time or another: over ossification;[2] constipation;[3] thin-shelled eggs;[4] the draining of shallow continental seas;[5] over-specialization;[6] the rise of the mammals;[7] a change in Earth's oxygen concentration;[8] too much fresh water;[9] sea-level changes;[10] the flooding of North America which bisected the continent in half due to Cretaceous global warming;[11] malfunctioning of male testes;[12] exotic diseases;[13] to say nothing about the infiltration of cosmic dust into Earth's atmosphere.[14]

Archibald, among others, believed that "there is no single overriding pattern of survival and extinction that clinches an argument for one or another ultimate cause of extinction."[15] He thus came to the conclusion that "we can reject outright single-cause explanations for mass extinctions."[16]

Archibald notwithstanding, however, not a single one of the above proposed causes—flooding rivers, flash floods, epidemics, tempests, sand storms, poisonous gases, volcanic eruptions—could, on its own, account for the extinctions of the world's entire dinosaurian stockpile. These are all local disasters none of which could have been enough on its own to exterminate the dinosaurs. Even if every one of them transpired here and there at one time or another, they could at best have only accounted for some local exterminations. What is needed is a single cause capable of wiping out all the dinosaurs scattered across the world—or at least one that would have incorporated all of the above.

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1 *Ibid.*

2 P. Hoffman, "Asteroid on Trial," *Science Digest* (June 1982), p. 60.

3 *Ibid.*; F. Warshofsky, *op. cit.*, p. 198.

4 *Ibid.*; K. Ward (Editor), *Great Disasters* (N. Y., 1989), pp. 11-12; A. J. Desmond, *op. cit.*, pp. 225-226.

5 F. Warshofsky, *op. cit.*, p. 204.

6 F. Hitching, *op. cit.*, p. 13.

7 *Ibid.*

8 *Ibid.*

9 G. Alexander, "Going, Going, Gone," *Science 81* (May 1981), p. 66.

10 *New Scientist* (September 3, 1981), p. 579; V. Clube & B. Napier, *op. cit.*, pp. 117, 125-126; R. Gore, "Extinctions," *National Geographic* (June 1989), pp. 667-668; N. D. Newell, "Paleontological Gaps and Geochronology," *Journal of Paleontology* 36 (1962), pp. 592-610; J. D. Archibald, *op. cit.*, pp. 149, 160, 164.

11 H. Pringle, "The Creature from the Zuni Lagoon," *Discover* (August 2001), pp. 47-48.

12 S. J. Gould, "Sex, Drugs, Disasters, and the Extinction of Dinosaurs," *Discover* (March 1984), p. 67.

13 R. Gore, "Dinosaurs," *National Geographic* (January 1993), pp. 34, 36; G. Poinar, "Paleontology," *Discover* (July 2005), p. 69.

14 A. Yee, "Cosmic Dust May Cause Climate Catastrophes," *Internet Digest* (1998: 2), pp. 10-11; *idem*, "Sir Fred Hoyle Vindicated After 60 Years," in *ibid.*, p. 12.

15 J. D. Archibald, *op. cit.*, p. 169.

16 *Ibid.*, p. 204.

There are, however, two proposed causes that bear closer scrutiny: volcanic eruptions and plate tectonics. Although they were not the only or first ones, Victor Clube and Bill Napier put their finger on a major pulse of the Cretaceous-Tertiary exterminations. "Coincident with the dinosaur extinction," they wrote, "was the greatest vulcanism in geological history."[1] Like others, they drew attention to the Deccan Traps,[2] an immense area of basaltic deposition which has been calculated to have originally covered 800,000 square miles of what are now adjoining parts of Pakistan and India.[3] The thickness of these basaltic flows vary from one locale to another. In some places they are no more than 30 feet thick, in others as much as 500 feet deep, 7,800 feet, or a mile and a half high. In volume they exceed 350,000 cubic miles.[4] "For those whose eyes glaze at high numbers," Archibald made plain, "consider this: the Deccan Traps contain almost enough basalt to cover both Alaska and Texas to a depth of 2,000 ft."[5]

All this lava, it has been theorized, did not pour out in a single catastrophic event. The outpourings were episodic and, originally, they were said to have been laid down over a period of 50 million years. Vincent Courtillot and his colleagues then managed to narrow the gap down to within 4 million years, but mainly to the 500,000 years corresponding to the Cretaceous-Tertiary boundary.[6] This correlation was based on radiometric dating, the 29th reversal of Earth's magnetic field, and the inclusions of vertebrate fossils.[7]

As Archibald stresses: "Changes in the Earth's magnetic poles have been examined as a possible cause of extinction, but no clear correlation was found."[8] Even so, the 29th polarity reversal might not have been purely coincidental.

In the meantime, writing for *National Geographic*, Rick Gore just about repeated Clube and Napier's very words:

> "Indeed, one of the greatest, outpourings of lava the world has known occurred at the K-T boundary. This basalt flow buried the Deccan region of India."[9]

But even then, outpourings of basaltic lava on their own, no matter how large a local area they end up covering, cannot be made to account for worldwide extinctions. What would be required is the explosive emission of material into the atmosphere. As Gore himself noted, "many volcanologists doubt that the relatively calm nature of lava eruptions would propel

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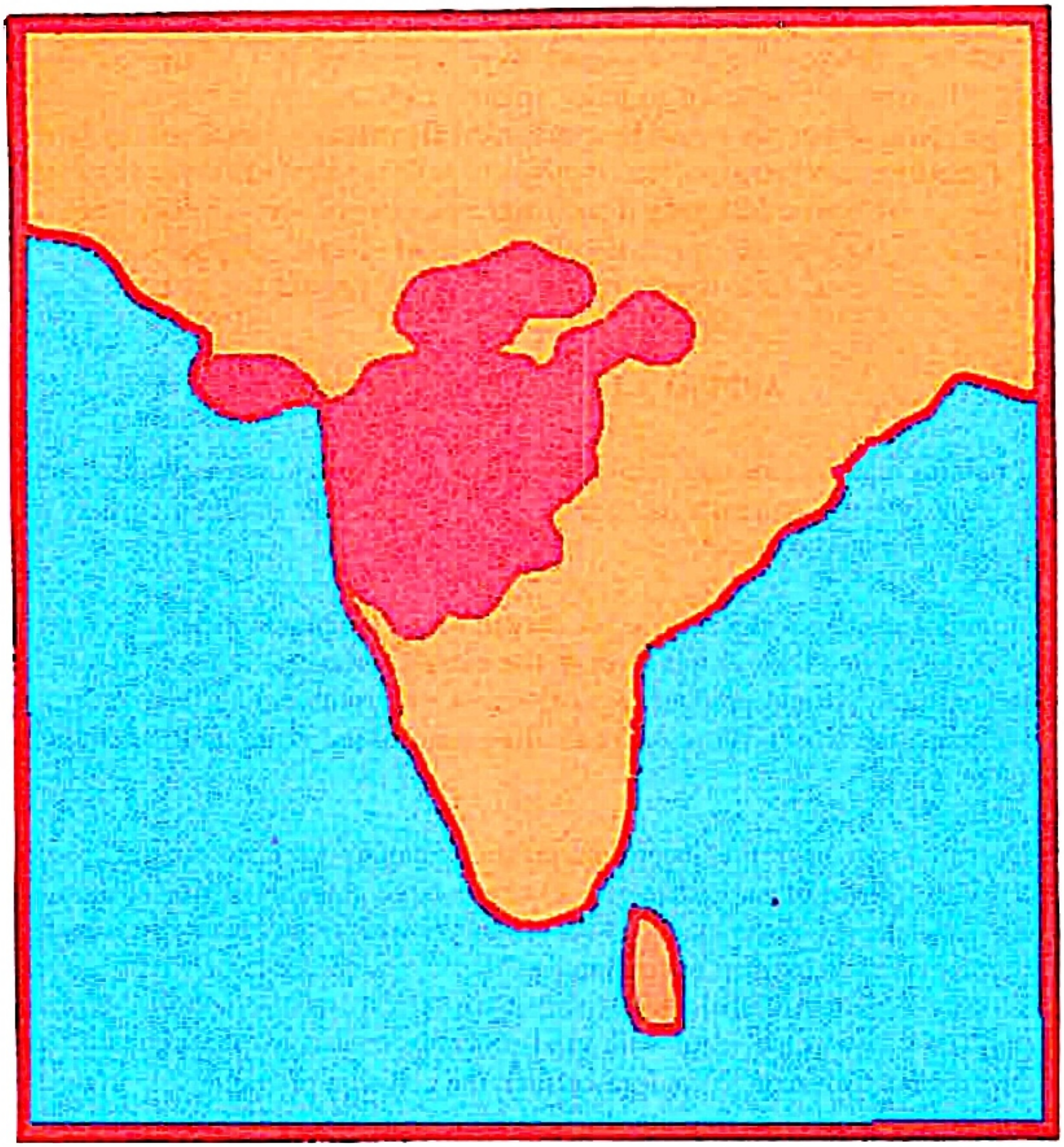
[1] V. Clube & B. Napier, *op. cit.*, p. 127 (spelling as given).
[2] *Ibid.*
[3] J. D. Archibald, *op. cit.*, p. 143.
[4] *Ibid.*
[5] *Ibid.*
[6] T. Palmer, *op. cit.*, p. 55.
[7] J. D. Archibald, *op. cit.*, pp. 143-144.
[8] *Ibid.*, p. 144.
[9] R. Gore, "Extinctions," *National Geographic* (June 1989), p. 692.



The area occupied by the Deccan Traps, shown in red, 800,000 square miles of basalt that straddles the adjacent regions of Pakistan and India.

much debris into the upper atmosphere."[1] This was clarified by Archibald when he wrote that: "Although one cannot eliminate the possibility of sudden, violent eruptions, most of the Deccan Traps erupted more like the Hawaiian volcanoes rather than Mt. St. Helens, although one must never forget that the emplacement of the Deccan Traps dwarfs either of these."[2]

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[1] *Ibid.*

[2] J. D. Archibald, *loc. cit.*

It is not that there is no evidence of explosive volcanic eruptions in connection with the dinosaur extinction. Back in 1984, Jack Horner and his team "found a bone bed where *at least 10,000 maiasaurs* had perished in a Mount St. Helens-style volcanic eruption."[1] Also, the dinosaurs of the Chinese Liaoning Province were discovered in fine-grained volcanic ash, where local eruptions are believed to have "triggered catastrophic die-offs."[2] As Gore indicates, intense volcanic activity would have disrupted atmospheric conditions by blocking sunlight and/or creating a greenhouse effect that would have aided, if not actually caused, the extinctions.[3] But, I must then add, only if such volcanic activity was not only intense, but also global in extent, as the evidence seems to call for. Global volcanic eruptions at about the same time could not, however, have been a coincidence. They cry out for an overriding cause of their own.

APPEALS TO PLATE TECTONICS

Flood basalt eruptions are believed to be spawned by superplumes, which have been described as globs of hot liquid lava rising through Earth's mantle and then pushing toward the surface in a concentrated stream.[4]

> "The funnel ends below the earth's outer crust, where the plume material spreads and ponds. If the molten rock erupts through the earth's surface, it releases gas and particulates into the air and produces lava flows. A superplume may be a gathering of small plumes, the size of those under the Hawaiian Island chain and Iceland, or one very large plume."[5]

The Deccan Traps have thus been interpreted as having risen due to such superplumes. "These basalt flows and other associated rocks have large amounts of magnesium, indicating their origin in the depths of the mantle."[6] As of now, however, "not enough evidence exists to indict superplumes as an extinction accomplice."[7]

Additionally, David Archibald believes that the "flood basalt eruptions" that resulted in the Deccan Traps "was coincident with (and probably related to) the collision of the subcontinent [of India] with Asia."[8] And, to be sure, the collision of continents brought about by plate tectonics had more than once in the past been proffered as the cause behind the annihilation of species. Speaking of the Permian extinctions, Stephen Jay Gould pointed out that the coalescence of landmasses into the giant continent of Pangaea would have eliminated

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[1] R. Gore, "Dinosaurs," *National Geographic* (January 1993), p. 42 (emphasis added).
[2] M. Norell, *op. cit.*, p. 59; C. Tarpy, *op. cit.*, pp. 86-87, 94.
[3] R. Gore, "Extinctions," *National Geographic* (June 1989), p. 666.
[4] N. Lubick, "Volcanic Accomplice," *Scientific American* (March 2001), p. 19; see also R. L. Larson, "The Mid-Cretaceous Superplume Episode, "*Scientific American* (August-September 2005, Special Edition), pp. 22 ff.
[5] N. Lubick, *loc. cit.*
[6] *Ibid.*; R. L. Larson, *op. cit.*, p. 25.
[7] N. Lubick, *loc. cit.*
[8] J. D. Archibald, *op. cit.*, p. 142.

many shallow seas. This would have aided the extermination of various marine creatures, even entire species.

The problem here is that while this may apply to the Permian period of the Palaeozoic era, it cannot be made to apply to the Cretaceous-Tertiary boundary and the disappearance of the dinosaurs for the simple reason that, by the time of the boundary in question, Pangaea had broken up again. In fact it is believed that the super continent would have re-fractured by the late Jurassic just previous to the Cretaceous period.[1] But then Gould informs us that the break-up of Pangaea was just as drastic in decimating life on our planet.[2] As Peter James astutely pointed out, however, one is hard put to understand why the dinosaurs would have suffered from the break-up of Pangaea—which break-up is stated to have taken place "at rates of only a few centimetres a year"—when they had already thrived through the supposed 120 million years of continental drift.[3]

By 1985, continental drift, due to plate tectonics, was still being offered as a prime cause of extinction. Changes in sea levels due to this process were not the only side effects mustered in favor of extinctions.

> "What is more [*TIME* magazine reported], the restless tectonic plates spawn volcanic eruptions, which spew carbon dioxide into the air. The increase in atmospheric carbon dioxide results in a greenhouse effect, which traps the sun's energy, causing temperatures on land and in the sea to rise markedly. Conversely, crustal movement may allow frigid ocean currents from the poles to invade tropical waters, leading to a worldwide drop in temperatures. Those species that cannot adapt to the earth's erratic behavior simply succumb."[4]

But as to whether it was global warming or global cooling that aided in the extinction of species, a consensus of opinion was never reached.

Even then, with the slow march of disconnected land masses away from their super-continental mother, the changes in sea levels and sporadic volcanic activity would have taken far too long, when measured in millions of years, to account for any kind of extinction, sudden or otherwise. After all, animals do adapt to environmental changes if these changes take place at the gradual pace which had till then been envisioned.

The years went by but the notion that continental drift was a prime cause behind various mass extinctions did not go away.[5] Neither did the problems associated with it, especially when it came to the eradication of the dinosaurs. True enough, in 1988 Trevor Palmer could still write that: "Indeed, there are now some indications as to how continental drift could have

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[1] A. Hallam, "Continental Drift and the Fossil Record," *Scientific American*, as quoted in "Evolutionary Problems," *SIS Workshop* 4:3 (1981), p. 25.

[2] P. J. James, "'Ever since Darwin': A Review," *KRONOS* VII:4 (Summer 1982), p. 30.

[3] *Ibid.*

[4] N. Angier, "Did Comets Kill the Dinosaurs?" *TIME* (May 6, 1985), p. 60.

[5] See here, for example, R. Gore, *op. cit.*, p. 667; T. Palmer, *op. cit.*, pp. 32-33.

brought about some of the major crises."[1] But even he had to admit that "continental drift can offer no obvious explanation for [the mass extinction] of the Late Triassic, Late Jurassic and Late Cretaceous periods."[2]

Regardless of all that, time continued to move on without any sign of jettisoning the plate tectonic theory of mass extinctions.[3] It was then found out, or at least theorized, that continental drift did not always proceed at the same slow rate. The western Pacific Ocean, for instance, was found to embody entirely different characteristics which date it to the mid-Cretaceous. It also appears to have been rapidly produced by one of those superplumes discussed above. This gave rise to a vast amount of magmatic material which resulted in a conglomeration of submarine plateaus and a slew of veritable mountain chains rising from the ocean floor.[4] There were also vast outpouring on the land itself. All of this, in turn, doubled the world's rate of oceanic crust production which would also have raised sea levels, resulting in a snowballing of geological and climatic changes.[5] One would of course have to compare these *raised* sea levels with Archibald's claim of marine *regression* at about the same time.[6] What is worse is that the question as to which view was right and which was wrong was never quite resolved. One can even ask: Is it ever?

That Pangaea split during the Cretaceous has now been sanctified by general acceptance.[7] But, as Richard Fortey informs us, "there were still possible connections, for it was neither a simple, nor a clean split."[8] Moreover, Fortey sees the break-up of the supercontinent as having been more likely to induce diversity among species than to have eliminated them. As he describes it:

> "Each [separated] continent carried with it a cargo of animals and plants, and when they were isolated from their common origin they evolved in isolation. This was a wonderful contribution to the richness of the natural world, for in this way five or six times as many species (or higher ranks of life as time passed) could be supported. Separation breeds diversity."[9]

Which, let's face it, makes much better sense.

THE IMPACT THEORY

Since nothing on Earth itself was ever found to satisfy the requirements of mass extinctions, it was inevitable that those searching for the solution would eventually look to outer space. And the most obvious of cosmic events is a direct hit on Earth by an astronomical

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[1] T. Palmer, "All that Glisters is not Gould," *Chronology & Catastrophism Workshop* (1988:2), p. 33.

[2] *Ibid.*

[3] R. Gore, "Dinosaurs," *National Geographic* (January 1993), p. 24.

[4] R. L. Larson, *op. cit.*, p. 24.

[5] *Scientific American* (February 1995), pp. 66-70.

[6] J. D. Archibald, *op. cit.*, p. 205.

[7] See here, for instance, R. Fortey, *op. cit.*, p. 267.

[8] *Ibid.*

[9] *Ibid.*, p. 268.

body. To be sure, the impact theory had been suggested at least as early as the mid-eighteenth century.[1] The same idea was revived in earnest by Allan Kelly and Frank Dachille, both of them geologists, in 1953.[2] Three years later, the paleontologist de Laubenfels continued in the same trend. As he wrote in the abstract to one of his papers on the subject:

> "Attention is called to the great destruction that resulted from a meteorite impact in Siberia in 1908. A larger impact would cause more widespread destruction. Several larger impacts may have occurred in geologic time. The survivals and extinctions at the close of the Cretaceous are such as might be expected to result from intensely hot winds such as would be generated by extra large meteoric or planetesimal impacts. It is suggested that, when the various hypotheses as to dinosaur extinction are being considered, this one be added to the others."[3]

There was also Digby McLaren, a geologist who was then working with the Geological Survey of Canada, who, in his 1969 presidential address to the Paleontological Society of America, stated more or less the same thing. Rather than serving the after-dinner platitude that presidential addresses usually turn out to be, McLaren saw fit to take geologists to task. What he posited during that address was that planetary fragments, asteroids, or meteorites had slammed into Earth at least once and perhaps many times more. And these impacts, according to him, would have snuffed out a massive number of plants and animals. This had been suggested to him by what he saw as evidence stemming from the Palaeozoic era that he had come across in Canada's Northwest Territories. As he himself later recalled: "Everybody thought I'd lost my cool." And: "I was subsequently told by students that their professors would recommend that they read the published text of the speech, but they'd say, 'Just don't take any notice of that ridiculous idea about meteorites'."[4]

And again, in 1973, Harold Urey did not only propose that cometary collisions may have been responsible for the termination of geologic periods, but also that such a collision might have destroyed the dinosaurs. As he wrote, "it does seem possible *and even probable* that a comet collision with the Earth destroyed the dinosaurs and initiated the Tertiary division of geologic time."[5]

1977 saw P. Béland and his team similarly advocating celestial bodies as the agents of mass extinction.[6] But then came the team of Alvarez, father and son, and they stole all the credit. The rest is history.

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[1] A. R. Hildebrand, "The Cretaceous/Tertiary Boundary Impact," *Journal of the Royal Astronomical Society of Canada* 87 (1993), pp. 77-118.

[2] A. O. Kelly & F. Dachille, *Target: Earth—The Role of Large Meteorites in Earth Science* (Pensecola, Florida, 1953) *in toto.*

[3] M. W. de Laubenfels, "Dinosaur Extinction: One More Hypothesis," *Journal of Paleontology*, Vol. 30 (1956), p. 207.

[4] P. Tisdall, "Earth's Great Dyings," *Equinox* (September/October 1984), p. 88.

[5] H. C. Urey, "Cometary Collisions and Geological Periods," *Nature* 242 (1973), p. 32 (emphasis added).

[6] P. Béland, *et al.*, "Chains of Events Leading to Mass Extinction: Two Synopses," in P. Béland (Ed.), *Cretaceous-Tertiary Extinctions and Possible Terrestrial and Extraterrestrial Causes* (Ottawa, 1977), pp. 155 ff.

Of course Luis and Walter Alvarez were not the only ones who started the impact ball rolling in earnest. Their team also included Frank Asaro and Helen Michel, but it was the name Alvarez that stuck to the theory.

Zeroing in on an asteroid as the projectile behind the extinction of the dinosaurs, the Alvarez team calculated that it would had to have been anywhere from four to six miles in diameter and that, traveling at 56,000 to 60,000 miles an hour, it would have produced a crater at least 60 to 90 miles across—or, as others reported, more than 100 miles across. Their paper on the subject appeared in *Science* in 1980.[1] And immediately the entire notion was pooh-poohed by those who had missed the mark. One authority in fact described it as "a nutty theory of pseudoscientists posing as paleontologists."[2] This time, however, the theory held—at least in general if not in detail.

Kenneth Hsu, for one, did not see much merit in an asteroidal impact as the cause for the dinosaur's demise. Instead he favored a *cometary* collision because comets are known to contain considerable quantities of cyanide—at least, Comet Kahoutek does. The heat generated by such a direct hit, according to Hsu, would have been a major cause of death in land animals. But marine organisms would not have been affected by the heat. He therefore reasoned that it would have been cyanide poisoning that would have eliminated the sea dwellers, including plankton, and that this would have further upset the food chain.[3]

As usually happens when a sensational theory hits the headlines, there were other contestants who started vying for fame while perched on the shoulders of the Alvarez team. There was even one attempt, feeble as it was, to compare the Alvarez scenario to that of Velikovsky.[4]

THE IRIDIUM LAYER

The Alvarez team based their impact theory on an anomalous layer of iridium which was discovered in the walls of the Botaccione Gorge near Gubbio in northern Italy. It happened when Walter Alvarez went to Gubbio to look for evidence of Earth's periodic magnetic reversals. While there he came across a one-centimeter layer of red-brown clay sandwiched between two sedimentary strata that straddled the Cretaceous and Tertiary periods. Cretaceous limestone stretched below the clay, while Tertiary limestone stretched above it.

> "No organisms are preserved in the clay. In the limestone above the clay the Cretaceous organisms are absent; they have been replaced by other organisms typical of the Paleocene."[5]

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[1] L. W. Alvarez, *et al.*, "Extraterrestrial Cause for the Cretaceous-Tertiary Extinction," *Science* 208 (1980), pp. 1095-1108.

[2] R. Matthews, "Ice Cubes from Space Prove the Scoffers Wrong," *The Sunday Telegraph* (June 1, 1997).

[3] K. J. Hsu, "Terrestrial Catastrophe Caused by Cometary Impact at the End of Cretaceous," *Nature* (May 22, 1980), pp. 201-203.

[4] V. Clube, "Cometary Catastrophes and the Ideas of Immanuel Velikovsky," *S.I.S. Review* V:4 (1980/81), pp. 107, 109.

[5] D. A. Russell, "The Mass Extinctions of the Late Mesozoic," *Scientific American* (January 1982), p. 58.

When Walter Alvarez showed samples of the clay to his father Luis, the latter decided to find out how long the hiatus represented by the clay had lasted.

A precious, heavy, and hard white brittle element of the platinum group, iridium is one of the densest terrestrial substances, practically insoluble in acids, difficult to fuse, with a melting point of 450° Centigrade. Generally obtained from the native alloy osmiridium, it is only recoverable in small amounts from platinum-bearing ores. A rare element on Earth, it is however sometimes spewed by volcanic eruptions. Because it is somewhat less rare in meteorites, concentrated particles of the metal found distributed in terrestrial geological strata have often been attributed to past meteoric impacts and/or to the steady rain of iridium dust ablated from meteorites as they burned through our atmosphere. This has been strengthened by the fact that the relative abundance of iridium particles in raised geological strata is entirely different from that found in Earth's deeper crust, but very similar to average meteoric material.[1] One more thing to keep in mind is that iridium is also found among the constituents that make up comets.[2] But when Luis compared the calculated meteoric ablation rate with the measured platinum content in the Gubbio strata, he was astonished to find that while the other platinum elements remained at nearly constant levels throughout the strata, iridium jumped from 0.3 ppb in both the Cretaceous and Tertiary limestone to 6 pbb in the clay between them. This amounted to a twenty-fold increase, while some had it at twenty-five-fold, and others even at thirty-fold.

In time, father and son, as well as others, discovered other layers with increased levels of iridium-rich clays sandwiched between the Cretaceous and Tertiary strata. One layer at Stevns Klint near Copenhagen, Denmark, disclosed a 160-fold enhancement while other 160-fold intensifications (others claim 450 times normal) have been found at Caravaca, in south-eastern Spain. Further evidence came from Woodsice Creek near Canterbury in New Zealand; Holland; the Hell Creek formation that straddles Montana and the Dakotas; as well as off the coast of Florida. Somewhat later, similar iridium anomalies were discovered in deep-sea cores retrieved from both the Atlantic and Pacific oceans, as well as in sedimentary rocks in the Raton Basin of New Mexico. And—wouldn't you know it—enhanced iridium was also discovered in the Deccan Traps.[3] By 1984, Luis Alvarez could cite 32 different geographical localities in which high concentrations of iridium had by then been found. Others had it reported as "60 other locales around the world."[4]

What is of even greater importance is that this high concentration of iridium appears only in the clay layer. It had obviously been at normal levels just prior to the laying down of the clay, and it had evidently returned to normal levels right after. Concentrations of that much iridium called for an extraterrestrial source and, in the end, the Alvarezes settled for a collision with an asteroid of the Earth-crossing Apollo family. Despite all those who had suggested the same thing prior to the Alvarezes, the disclosure was so stunning that Leo Hickey, who was then the director of the Peabody Museum of Natural History at Yale, is reported to have

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[1] J. S. Lewis, *Rain of Iron and Ice* (N. Y., 1996), p. 104.

[2] N. Calder, *The Comet is Coming!* (N. Y., 1980), p. 136.

[3] *Geology Today* (November/December 1995), pp. 212-213.

[4] P. Tisdall, *op. cit.*, p. 93.

said that: "My first thought was this is one of Walter's practical jokes."[1] And, in fact, there were still many in the scientific establishment who did not buy into the theory.

It seems, however, that the Alvarez team did not much care. They not only continued to push their theory, but were confident enough to embellish it with numbers. The weight of the asteroid was calculated to have been some 13 trillion tons. The dust ejected from the impact crater, which would have constituted 100 times the mass of the asteroid, would then have spread around the globe, effectively blocking out the light of the Sun for some three to five years—or, as others reported, for more than a decade. Photosynthesis would have come to a halt, forests would have died, and the food chain would have collapsed. Added to all this might have been a higher incidence of radiation that would have resulted from a breakdown of Earth's ozone layer. The only survivors would have been some plants with more viable seeds; small animals that could have continued to feed on nuts, seeds, and carrion; and shallow water organisms that managed to thrive on whatever organic debris would have been washed down to the sea by rivers.

There were also slight alternatives in detail. Thomas Ahrens and John O'Keefe suggested that "it may have been the heat generated on impact rather than the sun-obliterating dust that caused the mass extinction."[2] Computer-based data indicated that continental and oceanic temperatures would have "immediately" increased by at least 18 degrees Fahrenheit, which would have been "more than enough to wipe out much of the earth's marine and terrestrial life and to demolish the fragile ocean food chain."[3] And, like Kenneth Hsu before him, Nigel Calder leaned toward a cometary, rather than an asteroidal, impact.[4] But then the cometary alternative came up against the iridium content. "A comet consists largely of ice," it was still being argued, "and its concentration of iridium is lower than an asteroid's."[5] On the other hand, the heat effects suggested by Ahrens and O'Keefe, which would have caused forest fires, were soon taken on board the asteroidal band wagon. And there was more that these two suggested. Given that Earth's surface consists more of oceanic water than dry land, they saw it as more likely that the asteroid would have slammed into the sea. This, it was argued, would have triggered a three-mile-high tidal wave that would have swept around the entire Earth in 27 hours at a speed of 450 miles an hour. Besides the sudden destruction of life such a wave would have caused on impacting sea shores, its longer-lasting effects would have included the silting of low-lying vegetation which would have added to the destruction of trees on impact, and thus the obliteration of great swaths in the food chain.[6]

OSMIUM LENDS ITS WEIGHT

Because high concentrations of iridium was in time associated with the fall of tektites and volcanism, there were those who soon began to register a certain amount of doubt about the

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[1] N. Angier, "Did Comets Kill the Dinosaurs," *TIME* (May 6, 1985), p. 63.

[2] "Dinosaur Extinction Theory Updated," *GEO* (August 1981), p. 138.

[3] *Ibid.*

[4] N. Calder, *op. cit.*, pp. 128, 136.

[5] P. Hoffman, *op. cit.*, p. 61.

[6] "Tidal Wave Three Miles High may have Killed Dinosaurs," *GEO* (July 1982), p. 121.

impact theory. But—just in time, it seems—another rare element was spotted on the scene. Actually it had been known all along, but had not yet been enlisted as further evidence in favor of the impact theory. It was the team of Jean-Marc Luck and Karl Turekian that came to the rescue—if rescue had indeed been called for.

What Luck and Turekian pointed to was osmium which had also been found in sedimentary material dating to the end of the Cretaceous period. Osmium contains two isotopes, one of which is ten times as plentiful in Earth's crust as the other. Retrieved meteorites, however, are known to contain almost equal parts of the two forms of osmium isotopes. Luck and Turekian thus reasoned that if a meteorite—or, by extension, an asteroid—was to impact on Earth, "sediments laid down shortly after the impact should contain the isotopes in a ratio closer to that in meteorites than in the earth's crust." And this is "exactly" what they found. "Cretaceous sediments from Colorado and Denmark have osmium isotope ratios very close to those of meteorites."[1]

> "The simplest conclusion [Turekian was quoted as saying] is that the osmium is meteoric. Of course the data do not completely rule out the possibility that the osmium *and iridium* came from some giant volcanic explosion, but the probability of that is considerably smaller than the probability of a meteorite having struck the earth."[2]

Hints that the Cretaceous-Tertiary impactor had been a comet rather than an asteroid continued to surface despite the posited lower cometary content of iridium.[3] This was apparent in Carl Sagan and Ann Druyan's major work on comets.[4] "Occasionally," they wrote, "volcanoes can produce anomalously high concentrations of iridium, but material from the Cretaceous boundary shows alteration of the form and chemistry of minerals that are consistent only with an enormous shock—which can be provided by a cometary impact, but not by a volcanic eruption."[5] To be fair, however, they did include a footnote which reads: "While, in the following pages we do not everywhere add the words 'or asteroid' after 'comet,' we stress that there is still a significant probability that the Cretaceous impact was caused by an asteroid not of cometary origin."[6] But in 1989, Stephen Jay Gould was still hinting that "comets rather than asteroids" might have been the culprit.[7] And, after Gould, others continued to see-saw between an asteroid and a comet.[8] Never mind that comets were previously judged to be deficient in iridium, by 2005 they were declared to be entirely *void* of the element.[9]

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[1] "Isotopes and Dinosaurs," *Discover* (January 1984), p. 12.

[2] *Ibid.* (emphasis added).

[3] J. M. McCanney, "The Nature and Origin of Comets and the Evolution of Celestial Bodies" (Part III), *KRONOS* X:2 (Winter 1985), p. 48

[4] C. Sagan & A. Druyan, *op. cit.*, p. 292.

[5] *Ibid.*, p. 283.

[6] *Ibid.*

[7] S. J. Gould, "An Asteroid to Die For," *Discover* (October 1989), p. 63.

[8] S. Begley, "The Science of Doom," *Newsweek* (November 23, 1992), p. 56; L. Jaroff, "A Double Whammy?" *TIME* (January 9, 1995), p. 42; J. S. Lewis, *op. cit.*, p. 6; E. Stokstad, "Comet Caused Nuclear Winter," *Discover* (January 2005, Special Issue), p. 77.

[9] K. Wright, "The Day Everything Died," *Discover* (April 2005), p. 70.

Further evidence in favor of impact came from boundary samples from the Austrian Alps. These not only contained abnormally enriched iridium, but also chromium, cobalt, and nickel. Rapid deposition of these elements in the boundary clay is evidenced by the clay's lack of fossils. Other fall-out materials discovered by Bruce Bohor and colleagues, who at the time were with the U.S. Geological Survey, included glass-like (or microtektite-like) particles, indicative of melting, and shocked quartz particles, indicative of an impact event.[1] Other samples contained ratios of gold and platinum that were nearly identical to those found in meteorites. Nonbiological amino acids, which had previously been found only in meteorites, were also found just above and below the boundary clay.[2] As Jan Smit wrote: "Only a major impact with all its environmental consequences seems capable of explaining all lithological, trace element and biological evidence."[3]

To clinch the matter further, an iridium abundance abnormality was also discovered at the site of the 1908 blast, believed to have been caused by a meteoritic explosion, that took place in the Tunguska region of central Siberia. Similar abundances were also discovered in an ice core that was retrieved at the South Pole, which has been interpreted as having resulted from the Tunguska blast.[4]

Just as important was the evidence for a worldwide fire. This evidence was the result of chemical analysis by Edward Anders and his team from the University of Chicago who were looking for noble gases in the Cretaceous-Tertiary boundary clays. They did not find any. What they discovered instead were large amounts of elemental carbon that is "apparently part of a worldwide layer of soot."[5]

> "Under the scanning electron microscope, most of the submicrometer-sized particles show the characteristic morphology of carbon deposited from hot gas or flames, such as soot or carbon black: irregular, fluffy, often chainlike clusters of spheroids. No other process is known to produce this morphology."[6]

The soot has come from samples from widely separated localities such as Spain, Denmark, New Zealand,[7] and even Haiti.[1] Anders' team thus reached the conclusion that global

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[1] *Nature* (August 28, 1986), p. 794; *The Guardian* (September 13, 1986).

[2] J. Horgan, "In the Beginning..." *Scientific American* (February 1991), p. 124.

[3] J. Smit & A. J. T. Romein, "A Sequence of Events Across the Cretaceous-Tertiary Boundary," *Earth and Planetary Science Letters* 74 (1985), pp. 155-170; see also the additional references supplied by T. Palmer, "Tektites, Wildfires and the Extinction of the Dinosaurs," *Chronology & Catastrophism Workshop* (1987:1), pp. 3-4.

[4] R. Ganapathy, "The Tunguska Explosion of 1908: Discovery of Meteoric Debris Near the Explosion Site and at the South Pole," *Science* 220 (1983), pp. 1158-1161.

[5] "Dinosaur Extinction Linked to Global Fire," *Chemical & Engineering News* (October 7, 1985), p. 5.

[6] *Ibid.*; see also E. Anders *et al.*, "Cretaceous Extinctions—Evidence for Wildfires and Search for Meteoritic Material," *Science* 230 (1985), pp. 167-170.

[7] B. Rensberger, "A Fiery Extinction," *Science Digest* (January 1986), p. 22; R. Gore, "Extinctions," *National Geographic* (June 1989), p. 673.

wildfires would have been caused by the heat generated as the asteroid burned its way through the atmosphere. "Even as the vapor cooled, scattered hot rock particles would still have been hot enough to start individual fires."[2] In spreading, this would have caused greater damage to life than the darkening of the skies by the ejecta thrown into Earth's atmosphere. Enormous lightning discharges would have added to the holocaust. "The entire world caught fire," claimed one report.[3] Actually, 25% of Earth's biomass was calculated to have burned. Besides, as it was also argued, the carbon-bearing smoke would have absorbed sunlight far more efficiently than the ejecta from the impact.[4] An additional damaging side effect of all this would have been acid rain which would have affected plankton and any surviving land plants.

What did not attain wide publication was the discovery of carbon diamonds mixed with the soot. Speaking on carbon geochemistry, I. Gilmore was of the opinion that these diamonds had either formed by the impact, or are themselves of extra-terrestrial origin.[5]

The impact theory for the demise of the dinosaurs captured the imagination so well that by the year 2003 even their rise to dominance was being blamed on an asteroidal hit. As the paleontologist Paul Olsen who then hailed from the Lamont-Doherty Earth Observatory in Palisades, New York, and his colleagues reported, there are "clues that a large asteroid strike cleared the way for the dinosaurs by eliminating the competition 200 million years ago."[6]

THE SEARCH FOR THE CRATER

The next step in the Alvarez impact theory was to find the smoking gun. And, sure enough, geologists started scurrying all over the world in an attempt to find the asteroid's terrestrial scar.

Fred Whipple was of the opinion that the meteorite struck in Iceland. Well, not quite. According to him, it struck Earth's crust at or near an oceanic spreading ridge resulting in an upwelling of volcanic lava that would have *formed* Iceland.[7] This suggestion was soon discarded because, while Iceland is approximately of the right age, there was no oceanic spreading ridge at that time.[8]

Richard Grieve claimed to have discovered 100 terrestrial craters larger than half a mile in diameter, but he could date none of them to the Cretaceous-Tertiary boundary.[9]

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[1] J. S. Lewis, *loc. cit.*

[2] *Ibid.*; see also "In the Beginning?" in *ibid.*, pp. 36-37.

[3] R. Gore, *op. cit.*, p. 672.

[4] "Dinosaur Extinction Linked to Global Fire," *Chemical & Engineering News* (October 7, 1985), p. 5; K. F. Weaver, "Meteorites—Invaders From Space," *National Geographic* (September 1986), p. 409.

[5] D. Roth, "Society News," *Chronology & Catastrophism Workshop* (1994:1), p. 2.

[6] J. Winters, "Dinosaur's [sic.] Rise and Dominance Linked to an Earlier Asteroid Hit," *Discover* (January 2003, Special Issue), p. 76.

[7] *New Scientist* (March 19, 1981), p. 740.

[8] T. Palmer, "Iridium and the Extinction of the Dinosaurs," *S.I.S. Review* VII, Part A (1982/83), p. 17.

[9] P. Tisdall, *loc. cit.*

As Carl Sagan and Ann Druyan noted, a crater of 200 kilometers (124 miles) is too prominent to miss. According to them, only three are known. Two of them are deemed "much too old," while the third is much too young. Their opinion was that since Earth is two-thirds ocean, "the Cretaceous crater was most likely formed in the ocean depths." And: "Such a crater could be almost anywhere in the deep sea today, without anyone the wiser."[1]

> "Somewhere on the Earth [they go on], there was once a wound the size of Belgium or Corsica or Swaziland. Like a smallpox virus, the [impactor] left a small disfigurement as a reminder of surviving a near-fatal disease. But now even the pockmark may be gone, and the thin layer of clay that fell from the sky may be our sole souvenir, apart from the break in the fossil record itself, of the great Cretaceous catastrophe."[2]

The difficulty of locating an underwater crater, however, did not stop geologists from looking for it—and even finding it. At least, two Canadian scientists, Lubomir Jansa and Georgia Pe-Pier, *believed* they did. Analyzing the Montagnais structure that was known to exist in the sea bed about 120 miles southeast of Nova Scotia, they determined that "it is indeed an impact crater, close to 30 miles in diameter, with a raised central mountain like those seen in craters on the moon." And from the size of the crater they then estimated that the object that caused it must have been "more than a mile across." But, for one thing, the damned thing and the hole it dug was much too small and, for another, the scar was dated to some 15 million years *after* the extinction of the dinosaurs.[3]

The next crater that was promoted as the Cretaceous impact scar was the Manson structure in Iowa, with a diameter of about 22 miles. It had been filled with debris by the glaciers of the last Ice Age. Its calculated date of 66 million years was almost dead on. But, again, this was much smaller than theoretically expected, although some tried to save it by suggesting that the crater is actually much larger, with the apparent 22-mile hole being just an inner pit. Unfortunately, the area was judged to have been but a shallow sea at the time and could not therefore have generated the tsunami that was believed to have hit Texas.[4]

Another scar which vied for this particular fame was the Kara formation in Russia, but it, too, was dated a little too early.[5]

Michael Rampino, as well as others, suspected that the asteroid impacted in India, thereby causing the massive basaltic lava flows of the Deccan Traps. "If Rampino is right," wrote Rick Gore, "the K-T crater would be buried beneath the basalt."[6]

Next to compete for the title was a crater—if that is what it is—with a diameter of 180 miles known to exist in the Caribbean Sea off the coast of Colombia.[7] A layer of boulders on

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[1] C. Sagan & A. Druyan, *op. cit.*, pp. 284, 287.

[2] *Ibid.*, pp. 287-288.

[3] "There's a Hole in the Bottom of the Sea," *Discover* (September 1987), p. 20.

[4] R. Gore, *op.* cit., p. 693; *Des Moines Register* (February 4, 1988); *New Scientist* ((September 8, 1988), p. 38.

[5] *Ibid.*

[6] R. Gore, *loc. cit.*

[7] A. Hildebrand & W. Boynton, "Proximal Cretaceous-Tertiary Boundary Impact Deposits in the Caribbean," *Science* 248 (1990), pp. 843-847.

the island of Cuba and a 20-inch thick layer of material in Haiti were considered as evidence of the strike.[1] Great heaps of rough rocks deposited in Mexico, the Caribbean islands, and along the US coast from Texas to New Jersey, were also cited as evidence.[2] Skeptics, however, were of the belief that all this evidence is actually indicative of volcanic activity rather than an asteroidal impact.[3]

There were other sites nominated, but why burden further an already burdened chapter?

CHICXULUB

In the meantime evidence was mounting that the impact crater is located below the town of Chicxulub, near Progreso, on the northern coast of the Yucatan Peninsula in the Gulf of Mexico. What transpired is that in 1982, two geophysicists, Glen Penfield and Antonio Camargo, who were working for Pemex, Mexico's national oil company, were involved in surveying part of the Yucatan where they detected an anomalous ring-shaped rock formation a mile underground. Measuring 115 miles—some said only 110 miles—wide, this ring appeared less dense than the surrounding material. Their immediate surmise was that the formation might be an impact site. Unfortunately their drilling samples were lost when the warehouse in which they were housed caught fire and, as Carl Zimmer was to report years later, "the research slipped into obscurity."[4]

In 1991, Alan Hildebrand, a geologist from the University of Arizona, learned about the abandoned Pemex research and sought out Penfield who helped him track down some samples that had fallen into private hands. The samples were then found to contain quartz fragments which showed every indication of having been blasted by intense pressure, one of the signatures left behind by cosmic impacts.[5]

Further investigations revealed glassy and fractured rocks beneath deep marine deposits and splintered wood at the Chicxulub site. What was hailed as of great importance was the K/T layer itself which appeared to be thickest in locations close to Yucatan, becoming gradually thinner the farther away. Moreover, the impact would have been close enough to account for the deposits found in Haiti, Jamaica, and Cuba, while those found in Texas could have been transported there by the colossal tsunami the impact would have generated. Argon dating of the tektites found on Haiti, Jamaica, and Cuba pronounced the ejecta to be some 65 million years old, while the undisturbed Tertiary deposits immediately above the crater dated it to the same era. Calculations indicated that the asteroid would have been about 10 kilometers (6 miles) in diameter but, originally, the site would have been submerged beneath 165 feet of water, which would have been quite shallow by geologic standards. The impact, however, would have temporarily emptied a vast portion of the Gulf of Mexico.

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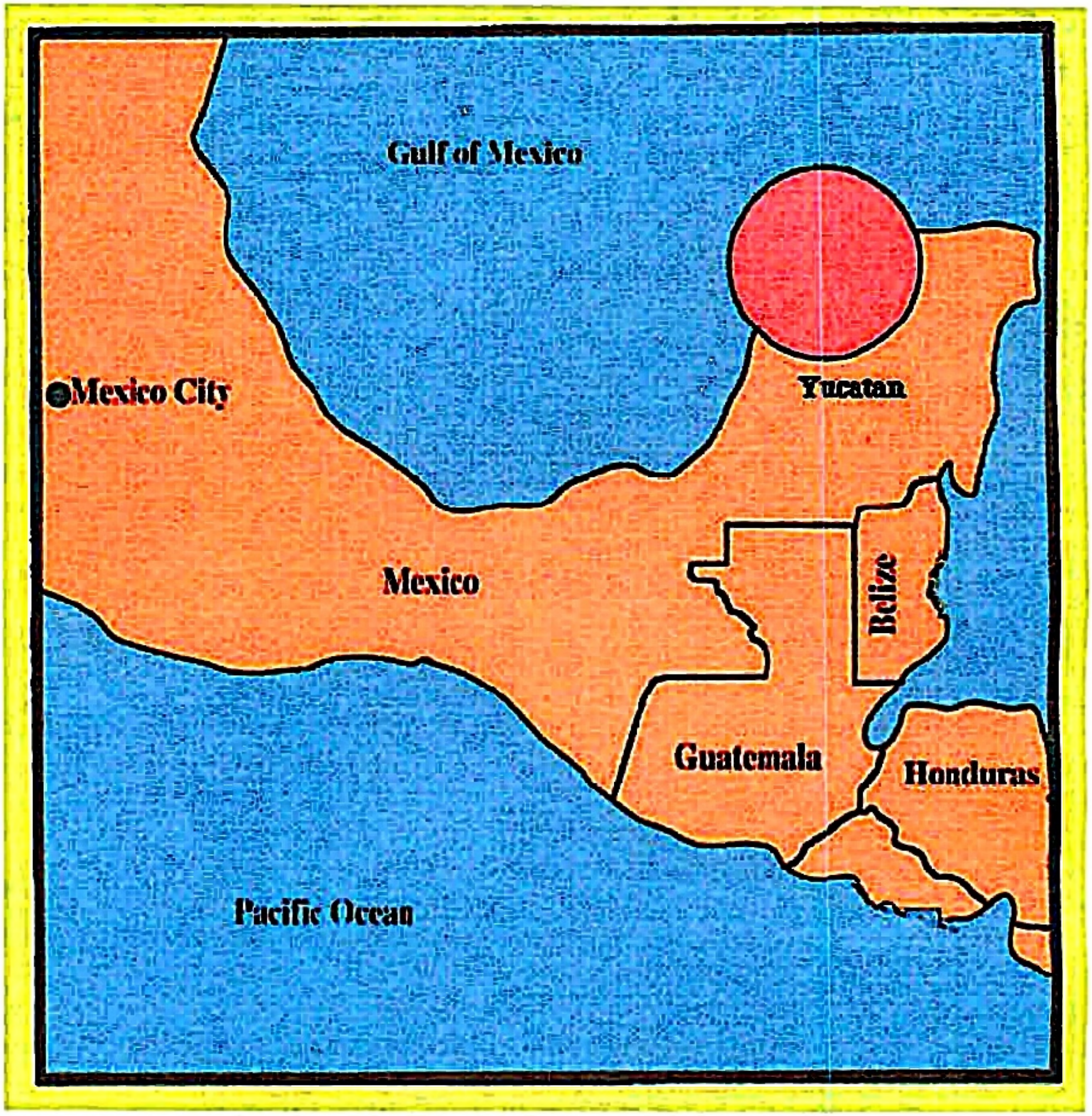
[1] *New Scientist* (April 21, 1990), p. 26.

[2] *Popular Science* (October 1990), p. 28.

[3] *New Scientist* (June 2, 1990), p. 30.

[4] C. Zimmer, "The Smoking Crater," *Discover* (January 1992), p. 48.

[5] *Ibid.*



Location of the Chicxulub Crater—red circle at top right.

It was also theorized that seismic waves from the impact might have caused high stress in the antipode.[1] And, due to the continental configuration of the time, the antipode might have centered on the Deccan Traps. If that had been the case, the superplume, or plumes, which gave rise to the Traps might have been due to a seismic reaction, or isostatic rebound, triggered by the impact.

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[1] L. Jaroff, *loc. cit.*

Walter Alvarez lapped it all up—and why not? "We finally have an excellent candidate for the impact site," he was reported as saying. "It ties everything together."[1] Charles Officer, on the other hand, called it "utter crap."[2]

A pebble found in a core sample retrieved from the Pacific Ocean by Frank Kyte was found to contain the tell-tale signs of an asteroidal fragment—high concentration of iridium, chromium, and iron.

"It's not the most important K/T discovery over the past 18 years," said Kyte, "but it's the coolest."[3] And: "We probably have a piece of the object responsible for one of the worst days in the history of Earth."[4] Two tiny pieces of quasi pure iridium also came from the Chicxulub site itself.

In time, the size of the Chicxulub Crater, as it became known, was revised up to 300 kilometers (186 miles) wide. The asteroid was theorized to have struck the Gulf of Mexico at an oblique angle, "producing a colossal blowtorch of death and destruction that blasted out in one direction over thousands of miles and only later widened to create a global pall..."[5]

By 1998 lobes formed by the ejecta were discovered at two separate sites by Adriana Ocampo and Kevin Pope who led an international expedition sponsored by NASA's Exobiology Program and the Planetary Society of Pasadena, California. One of these sites was in Belize, the other in Alvaro Obregon, in Mexico itself. The one in Mexico was composed of "layers of rock tens of feet thick that had flowed like molasses across the surface."[6]

> "The site [stated Pope in a NASA news release] contains two layers of material, or ejecta, thrown out by the impact that flowed across the surface like a thick fluid, known as fluidized ejecta lobes. This is the closest surface exposure of ejecta to the Chicxulub crater that has yet been found and the best example known on Earth from a really big impact crater."[7]

By 2002 it became apparent to those involved that the asteroid which gauged out the Chicxulub crater did not act alone. Multiple impacts became the name of the new game.[8] Or, as others have suggested, the Chicxulub impactor may itself have been but a fragment of a much larger object.[9]

And yet—I hate to have to say it—all of that changed again by 2006. Multiple impacts did not accomplish the deed, or so stated Ken MacLeod from the University of Missouri-Columbia. Rock sediments drilled from five separate sites at the bottom of the Atlantic were

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[1] *Ibid.*

[2] J. Horgan, "Caribbean Killer," *Scientific American* 265:2 (1991), p. 12.

[3] C. Kulyk, "Deep-Space Impact," *Equinox* (February/March 1999), p. 18.

[4] "Scary Asteroids: Bits and Pieces of Armageddon," *Discover* (March 1999), p. 24.

[5] W. J. Broad, *New York Times* (November 26, 1996).

[6] G. Schueller, "Dinosaur Killer Sheds Light on Mars," *Astronomy* (July 1998), p. 30.

[7] NASANews@hq.nasa.gov (March 12, 1998).

[8] See here, for instance, *The New York Times* (May 11, 2002); *Connecticut Post* (August 29, 2002).

[9] *New Scientist* (December 14, 2002), p. 16.

said by him to strongly support the notion that a single massive hunk of space debris was to blame.

But if you think that was the end of it, think again.

Chapter 8

Paradigms Lost

THE GREAT DYINGS

The Cretaceous-Tertiary boundary extinction, wrote Stephen Jay Gould, is "the most famous of all because it sounded the death knell of dinosaurs."[1] But it was not by any means the greatest extinction life on Earth has experienced. Karen Wright might have stated it best when she wrote that: "What the tabloids won't tell you is that the fall of the dinosaurs, while spectacular, is second-rate."[2] Various other extinctions occurred at the end of the Cambrian, Ordovician, Devonian, Permian, and Triassic periods.[3]

> "These and other mass extinctions [Trevor Palmer noted] took place over very short periods of geological time, but whether this was, in any particular instance, a million years, a thousand years, a hundred years or a day is far from certain. In no case has the cause been firmly established, nor is it known over what timescale any cause might have acted; after all, *an event lasting less than a day could have set in motion a sequence of events which took thousands of years to work itself through to a conclusion.*"[4]

By 1984 geologists could not only recognize the above-named major extinctions, but also "hundreds of minor ones."[5] But what transpired most of all is that, following the rediscovery of the Chicxulub crater, geologists and paleontologists started scurrying in an endeavor to discover the possible scars left by the impacts that might have been responsible for all these other past extinctions. Nor was the scurrying in vain. As Adalberto Notarpietro could claim in 2001: "In the geological layers corresponding to 7 of [the major extinction] layers, iridium has been found in high concentration, indicating a likely extraterrestrial cause."[6]

Speaking of the earliest extinction that is presently known, that of the Precambrian period dated to 590 million years ago, Richard Fortey wrote:

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[1] S. J. Gould, "All the News that's Fit to Print and Some Opinions that Aren't," *Discover* (November 1985), p. 87; see also *Idem*, "Of Dinosaurs and Asteroids," *1982 Yearbook of Science and the Future* (Chicago, 1981), p. 122.

[2] K. Wright, "The Mother of All Extinctions," *Discover* (October 2001), p. 28.

[3] L. Becker, "Repeated Blows," *Scientific American* (March 2002), pp. 76. ff.

[4] T. Palmer, "Catastrophism and Evolutuion," *S.I.S. Review* VII, Part A (1982/3), pp. 13-14 (emphasis added).

[5] P. Tisdall, "Earth's Great Dyings," *Equinox* (September/October 1984), p. 88.

[6] A. Notarpietro, "'Earth in Upheaval' of Velikovsky and Catastrophes of Extraterrestrial Origin in History of Earth," *Proceedings of the Symposium—Fifty Years After Worlds in Collision by Velikovsky: Classical and New Scenarios on the Evolution of the Solar System* (Bergamo, 2002), p. 135.

> "It is beyond dispute that one of the greatest transformations in the history of the planet took place at the end of the Precambrian and close to the base of the Cambrian. This is when Earth moved from childhood to adolescence, and when the lineaments of adulthood became inscribed upon its character. The changes happened quickly."[1]

In China, the by now tell-tale signs of a high iridium level have been detected at the very boundary between the Precambrian and Cambrian periods, just "before the Cambrian explosion of invertebrate evolution."[2] And although we are here talking mainly of algae and bacteria, entire species disappeared without leaving a trace. As Fortey expressed it, something was taken away, never to reappear.[3]

In the Cambrian explosion that followed, most of the major phyla of invertebrates appeared, some would say "within a few million years."[4] But then, at the end of this period, dated to 500 million years ago, it happened all over again when "almost two thirds of existing families of trilobites disappeared."[5] This time, however, when an iridium abundance anomaly was sought at the boundary in the uplifted marine limestone in Western Utah, none was found.[6]

High concentrations of iridium *were* however discovered "in possible association with a crater that might date from the time of the [later] Ordovician extinctions" dated to about 438 million years ago.[7]

> "A more certain finding of raised iridium at the Ordovician-Silurian boundary has come from sites on Anticosti Island, Quebec, and Dob's Linn, Scotland. However, no microtektites or other evidence of an impact were present, and the investigators concluded that the high iridium concentrations could have arisen from erosion of exposed upper mantle rocks."[8]

The next major extinction transpired at the end of the Devonian period, dated to 360 million years ago. A 120 mile wide impact crater from this period is located north of Perth in Australia. Of the asteroid that supposedly carved this crater it was said that it "was not vaporised but incorporated itself in the surrounding granite, which was uplifted and is enriched in minerals, including gold."[9]

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[1] R. Fortey, *Life: A Natural History of the First Four Billion Years of Life on Earth* (N. Y., 1998), p. 83.

[2] K. J. Hsu, *et al.*, "Strangelove Ocean Before the Cambrian Explosion," *Nature* 316 (1985), pp. 809-811; see also *Scientific American* (December 1992), pp. 20-21.

[3] R. Fortey, *loc. cit.*

[4] T. Palmer, *op. cit.*, p. 13.

[5] *Ibid.*

[6] C. J. Orth, *et al.*, "A Search for Iridium Abundance Anomalies at Two Late Cambrian Biomere Boundaries in Western Utah," *Science* 223 (1984), pp. 163-165.

[7] C. R. Seeger, "Dating of Craters and Extinctions," *Nature* 317 (1985), p. 207.

[8] P. Wilde, *et al.*, "Iridium Abundances Across the Ordovician-Silurian Stratotype," *Science* 233 (1986), pp. 339-341; S. K. Donovan, "Iridium Anomalous No Longer," *Nature* 326 (1987), pp. 331-332.

[9] "A History of Impact Effects," *Chronology & Catastrophism Review* (2002: 2), p. 46.

Following that, the Permian-Triassic transition, calculated to have transpired 250 million years ago, dwarfed all previous boundary exterminations. Karen Wright rightly called this the mother of all extinctions.[1] And, as she just as rightly noted:

> "The Permian extinction isn't likely to get the Hollywood treatment anytime soon for at least two reasons. One is the cast of characters: on land, an ensemble of stupid, slow-moving creatures likened by one scientist to 'naked turtles' and 'sausages with beaks.' The Permian ocean also lacks charisma—unless snails, clams, fish, and trilobites do it for you...But the real trouble with pitching the Permian extinction is that no one knows how the story ends."[2]

And yet:

> "Thousands of species simply vanished from the fossil record. It took life millions of years to recover."[3]

As Wright went on to report:

> "Until recently, geologists and paleontologists thought the Permian extinction itself occurred over millions of years, the result of gradual changes in climate and sea level that are common in Earth's history. But new studies have unearthed increasing evidence of sudden death. In 1997, analyses of radioactive decay in Permian sediments showed that the mass extinction may have taken place over a period of less than half a million years. Subsequent studies of other sediment features reduced that figure to 10,000 years or less. And according to an exhaustive fossil census [Doug] Erwin and his colleagues conducted last year, *the Permian extinction may have gone down virtually overnight.*"[4]

During this massacre, as Nigel Calder called it, nearly all animals perished. The casualties on that occasion included the famous trilobites and sea scorpions of the sea floor, most of the bryozoans, brachiopods, crinoids, and ammonites, as well as many early species of reptiles.[5] And they all "died out in a very short period of geological time."[6]

Jan Smit and other geologists started to investigate a tell-tale layer of clay at the top of the Permian rocks.[7] Five years later no hint of an iridium anomaly had yet come to light.[8]

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[1] K. Wright, *op. cit., in toto.*

[2] *Ibid.*, p. 28.

[3] *Ibid.*

[4] *Ibid.* (emphasis added).

[5] "Lion-Lizard Combo Found," *Discover* (April 1999), p. 24.

[6] T. Palmer, *loc. cit.*

[7] N. Calder, *The Comet is Coming* (N. Y., 1980), p. 139.

[8] C. Sagan & A. Druyan, *Comet* (N. Y., 1985), p. 292.

Eventually, however, an iridium abundance was found, "though not confirmed," at the Late Permian extinction horizon in China.[1]

The proposed crater for this event was ultimately located in Australia and, remarkably, very much like the Chicxulub crater, it is now buried underground and, even more remarkably, again like the Chicxulub crater, half of it is now under the sea. What remains is "a large underwater dome" which had long been known, named the Bedout High.[2] Such uplifted areas had also long been suspected to be "a common feature of impact craters." Kathy Svitil reported the age of the crater as "250 million years old, within the ballpark of the extinction." Luann Becker was more precise when she dated shocked materials from the site at 250.7 million years. Melted minerals of a similar age were also located across Australia and other parts of the world which at that time, or so it is believed, formed the southern supercontinent of Gondwanaland. Gravity data and seismic soundings revealed a ring surrounding the central dome, which again is a trait similar to the Chicxulub crater. The 125-mile wide crater has been calculated to have been created by an object 6 to 9 miles across, "possibly big enough to help trigger major geologic events."[3]

Needless to say, there is no crater to be seen on the surface, "so it took some detective work to find the impact site, some 200 metres underground and partly beneath the ocean, 160 kilometres southeast of Carnarvon, near Shark Bay." Shocked quartz grains in an old photograph of a core sample drilled at the site in 1981 was enough to convince Franco Pirajno. Now named the Woodleigh crater, it is considered the largest ever discovered in Australia and fourth largest in the world.[4]

Researchers continued to consider the "probability of large impacts occurring at the same time as plume events." One of these might even be associated with the Permian-Triassic boundary extinction.[5] And, still, those who favored cometary impacts, like Kunio Kaiho of Tohoku University in Japan, claim to have uncovered evidence that the Permian-Triassic event was caused by Earth's collision with a comet.[6]

Although not considered as extensive as the Permian-Triassic boundary event, the next extinction, at the boundary of the Triassic and Jurassic periods, dated to 200 million years ago, was one of the three largest in the palaeontological record.[7]

> "Many species were hard hit, and the great crocodile-like creatures that had flourished before completely disappeared. Most creatures that survived were small."[8]

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[1] S. K. Donovan, *loc. cit.*; D-Y. Xu, *et al.*, "Abundance Variation of Iridium and Trace Elements at the Permian-Triassic Boundary at Shansi in China," *Nature* 314 (1985), pp. 154-156.

[2] Pronounced "Be-doo High."

[3] K. A. Svitil, "Australian Crater Implicated in Global Rubout," *Discover* (January 2005), p. 40: see also J. K. Beatty, "Ground Zero for the 'Great Dying'?" *Sky & Telescope* (August 2004), p.26; K. Wright, "The Day Everything Died," *Discover* (April 2005), pp. 66 ff.

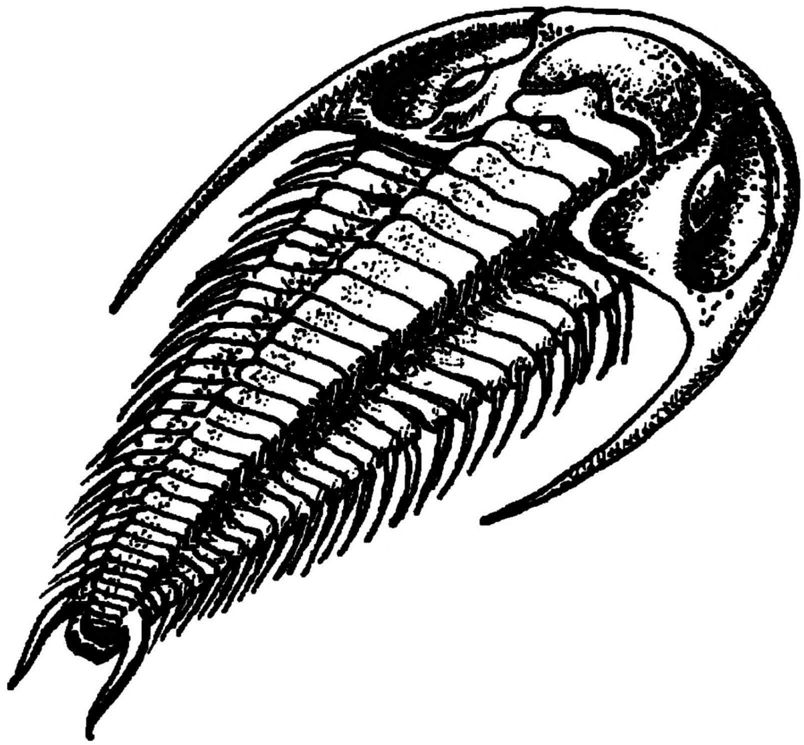
[4] C. Kulyk, "Thunder Down Under," *Equinox* (September 2000), p. 20.

[5] N. Lubick, "Volcanic Accomplice," *Scientific American* (March 2001), p. 19.

[6] B. Berman, "Things that go Bump in the Night," *Discover* (October 2002), p. 30.

[7] *New Scientist* (November 24, 1990), p. 25.

[8] W. Grady, "A Crater Necklace," *Equinox* (July 1998), p. 18.



Close to two thirds of the existing trilobites, one of which is shown above, disappeared at the end of the Cambrian period. The rest died out completely during the later Permian period.

As in previous extinctions, the disappearance of species, including "many of the primitive reptiles, amphibians and fishes," was a rapid one.[1] Researchers in the Bay of Fundy, Nova Scotia, excavated fossils that have assured them beyond reasonable doubt that the extinction event in question was definitely a catastrophic one. The Bay of Fundy site, "described as one of the largest fossil finds in North America," yielded "thousands of fragmentary remains of primitive dinosaurs, crocodiles, sharks and mammal-like reptiles from sandstone embedded in cliffs that drop to the tidal flats." The greatest evidence in favor of this event as a catastrophic one comes from "the total absence, in deposits laid down immediately after that period, of species abundant just before the end of the period, implying a very sudden disappearance."[2]

The discovery of shocked quartz at the boundary was enough to convince most geologists what had happened.[3] At first there were those who believed that Manicouagan crater in Quebec, Canada, could fill the required scar.[4] Radiometric dating, however, indicated that Mani-

[1] T. Palmer, *op. cit.*, p. 13.

[2] W. Sullivan, "Fossil Finds Back Theory of Catastrophic Extinction," *The Vancouver Sun* (November 15, 1986), p. B6.

[3] *New Scientist, loc, cit.*

[4] N. Calder, *op. cit.*, p. 139.

couagan "was formed several million years before the mass dying."[1] But then it all depends on whom one consults. Thus, according to a report by Wayne Grady, the Manicouagan Crater *is* the right age, but, being much smaller than the one at Chicxulub, it was still being considered inadequate to have caused the Triassic-Jurassic extinctions. Yet even then, not for long. John Spray, who hailed from the University of New Brunswick, as well as others, pointed to five other craters on Earth, including two in Canada, which have been dated to approximately the same age as Manicouagan and formed at about the end of the Triassic.[2]

> "By pinpointing all five craters on a map of the planet's landmasses as they were 214 million years ago, the scientists have found they form a chain that stretches from the Ukraine, through France, and across North America...Five meteorites hitting the earth at once could account for the unparalleled extinctions that mark the late Triassic period."[3]

"Single impacts are known to have occurred on a regular basis," Spray was reported as saying. "But this is the best evidence we have so far that multiple impacts can occur."[4]

Paul Olsen and his colleagues have argued that the large asteroid strike that brought the Triassic period to an end "cleared the way for the dinosaurs by eliminating the competition." At that time, "carnivorous dinosaurs were small creatures that lived in the shadow of other reptiles," but in the following period dinosaurian feet alone, gauged by imprints left in sedimentary rock, appear to have grown "by 40 percent" while the bulk of their bodies "more than doubled in mass." And, once again, lake sediments from the era disclosed a layer that was rich in iridium.[5]

Following the Cretaceous-Tertiary boundary and the death of the dinosaurs, another extinction event is evident between the Eocene and Oligocene, which are epochs within the Tertiary period itself, dated to some 36 million years ago. Like others before it, this boundary is also marked with microtektites. Moreover, R. Ganapathy has investigated this stratum from a core that was drilled in the Venezuelan Basin in which he discovered the expected high iridium levels. A separate team working under Walter Alvarez himself also found high iridium concentrations in similar cores from the Caribbean sea bed. These two sets further strengthened the case for an asteroidal impact as the cause for the extinctions at the end of the Eocene epoch.[6] But even then there were some doubts.

> "The iridium signal associated with the Eocene-Oligocene boundary, however, is difficult to interpret—there is some evidence that there may have been a series of lesser extinctions over several million years, for instance—and until very recently, there

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[1] R. Gore, "Dinosaurs," *National Geographic* (January 1993), pp. 14, 24.

[2] W. Grady, *loc. cit.*

[3] *Ibid.*, p. 18.

[4] *Ibid.*

[5] J. Winters, "Dinosaur's [sic.] Rise and Dominance Linked to an Earlier Asteroid Hit," *Discover* (January 2003, Special Issue), p. 76; see also C. Zimmer, "Dinosaurs," *Discover* (April 2005), p. 34.

[6] *New Scientist* (June 3, 1982), p. 647.

Manicouagan Crater, Quebec, Canada.
(Photograph by the Landsat 1 satellite, courtesy of NASA.)

was little reason to suppose that extraterrestrial impacts were responsible for any mass extinctions other than the one associated with the dinosaurs."[1]

And again, as before, there were those who were still favoring comets rather than asteroids, even for the Eocene event.[2]

The final conclusion, however, was best presented by Digby McLaren when he stated that the discoveries of strong iridium anomalies coincident with major extinctions not only strongly suggest a common cause, but that this cause is to be found in extraterrestrial impacts. "Catastrophism," in McLaren's view, "is now an absolutely necessary geologic hypothesis."[3]

Even so, as Zeeya Merali noted, there remains a large margin of error when it comes to dating impact events that are older than the one which created the Chicxulub crater.[4]

PERIODICITY OF EXTINCTIONS: PROS AND CONS

Given all the above, the next step was inevitable. By 1983, Jack Sepkoski and his colleague David Raup—the same one who could not formerly decide between rapid and gradual extinction—had correlated the dates that had been tagged to extinction events and came to the conclusion that mass extinctions have taken place with a regular periodicity every 26 million years.[5]

The biggest problem with the above was the time scale used by Sepkoski and Raup. Although it is hardly, if ever, mentioned in popular works and the media, there is actually more than one geologic time scale that is favored by this or that geologist and/or palaeontologist. These different time scales vary from one another by millions of years. And, as A. Hallam noted, there is no definite proof that any one of them is correct. Sepkoski and Raup's periodicity, claims Hallam, might turn out to be nothing more than a figment of statistical imagination.[6] Nor was Hallam alone. Antoni Hoffman raised the same objection:

> "The evidence is strongly contingent on arbitrary decisions concerning the absolute dating of stratigraphical boundaries, the culling of the data-base and the definition of what is mass extinction as opposed to background extinction. This evidence becomes insufficient under other plausible geological timescales and other acceptable definitions of mass extinction. Analysis of the non-culled database shows that the reliability of identification of mass extinctions and their timing is at present extremely limited. It also suggests that the apparent periodicity of mass extinction results from stochastic processes."[7]

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[1] P. Tisdall, *op. cit.*, p. 93.

[2] "Comets Showered Eocene Earth," *Astronomy* (September 1998), pp. 28, 30.

[3] P. Tisdall, *loc. cit.*

[4] Z. Merali, "Climate Blamed for Mass Extinctions," *New Scientist* (April 1-7, 2006), p. 18.

[5] D. M. Raup & J. J. Sepkoski, "Periodicity of Extinctions in the Geologic Past," *Proceedings of the National Academy of Sciences of the U.S.A.*, 81 (1984), pp. 801-805.; see also C. Sagan & A. Druyan, *op. cit.*, p. 292.

[6] *Nature* (April 19, 1984), pp. 686-687.

[7] A. Hoffman, "Patterns of Family Extinction Depend on Definition and Geological Timescale," *Nature* 315 (1985), p. 659.

While Sepkoski and Raup were not deterred by such criticism, they *did* exhibit an iota of caution in their later works. Claiming that the evidence for a 26 million year periodicity "is strong enough to merit further search for confirming evidence," they nonetheless confessed that because they are "dealing with statistical inference in a complex situation, completely satisfactory conclusions will be reached only with higher resolution data on extinction and on other relevant aspects of biological and geological history."[1]

By 1991, Raup was still of the opinion that "periodicity is alive and well as a description of extinction history during the past 250 million years."[2] And yet he knew well that the theory, to say the least, was still up in arms.

> "The debate has pretty much died down [he wrote] because most scientists involved have decided that the extinction data do not show periodicity. But the proposal is still on the table, awaiting new data or new ways of looking at old data."[3]

Despite all that, the idea of periodicity did not go away. Through the use of a different set of data, Michael Rampino and Richard Stothers vouched for a 30 million year cycle.[4] Digby McLaren, on the other hand, was sure the period consisted of 32 million years.[5] And, as if all this was not enough, others arrived at 28.4 million years.[6] As of this writing, Rampino's last proclamation is that "there *are* periodicities, but on scales roughly between 25 and 35 million years, rather than the more precise, previously held figure of about 26 million years."[7]

NEMESIS, THE MILKY WAY, AND PLANET X

The proposed periodicity required a cause. And, despite the objections that had been raised against it, to say nothing of Raup's special pleading and Rampino's hedging, it did not take long to find, not one, but three possible culprits.

The first of these was proposed by a group led by Richard Muller, a physicist and former student of Luis Alvarez. This proposal has been likened by Paul Tisdall to "the stuff of science fiction, the pulp of a thousand dime-store novels: a death star wheeling about the solar system in a looping 26-million-year orbit of the sun, trailing chaos and devastation in its wake."[8] According to Muller, this hypothesized death star has to be a companion star to our Sun. Its passage through the just as hypothesized Oort cloud every 26 million years would perturb the cloud's aggregation of debris, dislodging some of its fragments to send them hur-

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[1] D. M. Raup & J. J. Sepkoski, "Periodic Extinction of Families and Genera," *Science* 231 (1986), pp. 833-836.

[2] D. M. Raup, *Extinction: Bad Genes or Bad Luck?* (N. Y., 1991), p. 165.

[3] *Ibid.*

[4] M. R. Rampino & R. B. Stothers, "Terrestrial Mass Extinctions, Cometary Impacts and the Sun's Motion Perpendicular to the Galactic Plane," *Nature* (April 19, 1984), pp. 709-712.

[5] P. Tisdall, *op. cit.*, p. 88.

[6] *Ibid.*, p. 100.

[7] B. Dorminey, "Dark Threat," *Astronomy* (July 2005), p. 43 (emphasis added).

[8] P. Tisdall, *op. cit.*, p. 85.

tling toward Earth in a cometary shower "that lasts a million years."[1] Through the use of an automated telescope at the University of California at Berkeley, Muller "confidently claims that he will find our sun's companion within a matter of months, small and faint though it might be."[2] "If and when the companion is found, we suggest it be named Nemesis, after the Greek goddess who relentlessly persecutes the excessively rich, proud and powerful," he wrote, but added that: "We worry that if the companion is *not* found, this paper will be *our* nemesis."[3]

That was in 1984.

The major problem with this theory was pointed out by Eugene Shoemaker who argued that the death star's projected orbit would be so unstable as to render unlikely the star's regular return to the vicinity of the Sun.[4] This did not, however, stop other astronomers from looking for it.[5]

But even if found, Gould did not much care for the name Nemesis, claiming that it would be a misnomer. Instead he suggested the name Siva (or Shiva), the Hindu god of destruction.[6]

My own personal feeling, however, is that both suggested appellations will turn out to have been nothing but a waste of mythological names. As of this writing—well into 2008—not only has Nemesis not been found, neither has any evidence of its possible existence.[7]

The second proposal sounds less fantastic and, in its own way, somewhat more plausible. The child of Michael Rampino and Richard Stothers, it has become known simply as the Milky Way theory. In simple outline this theory relies on the fact that as the Solar System journeys around the Milky Way, it bobs up and down across the galactic plane where most of the matter in the galaxy is concentrated. The system is therefore bound to encounter dense clouds of cosmic dust. The gravitational pull of this dust disturbs the Oort cloud with the same result as the death star theory.[8] This bobbing up and down takes place "with a regular harmonic motion once every 33 million years or so." This was close enough to Rampino and Stothers' "revised cratering peak of 31 million years."[9]

The major problem with *this* theory was pointed out by the competing Muller who reminded everyone that the Solar System is even now in the middle of the galactic plane. And as Tisdall whimsically noted, "we obviously are not dodging the predicted comet shower."[10]

The third proposal was somewhat similar to the Nemesis death star theory. Instead of a companion star, this hypothesis calls for the existence of a tenth planet within the Solar System itself. (We say "tenth" because Pluto had not been demoted yet.) It was first imagined

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[1] *Ibid.*, pp. 86, 98.

[2] *Ibid.*, p. 98.

[3] *Ibid.* (emphasis added).

[4] *Ibid.*, p. 100.

[5] N. Angier, "Did Comets Kill the Dinosaurs?" *TIME* (May 6, 1985), p. 67; P. Hut, "Periodic Comet Showers: The Mainspring of Evolution?" *1986 Yearbook of Science and the Future* (Chicago, 1985), p. 57.

[6] C. Sagan & A. Druyan, *op. cit.*, p. 305.

[7] J. Winters, "A Brief Tour of a Bad Cosmic Neighborhood," *Discover* (April 1998), p. 58.

[8] P. Tisdall, *op. cit.*, pp. 91, 100.

[9] *Ibid.*, p. 100.

[10] *Ibid.*

into theoretical existence in 1971 by Joseph Brady who had found a discrepancy in the periodic orbits of Halley's Comet. He had therefore reasoned that the comet was being slowed down in its orbit by the gravitational attraction of an undiscovered planet. It was he who dubbed it Planet X. A search of the planet, however, came up empty handed.[1] But, like Muller, Brady continued to insist that Planet X will eventually come to light.[2]

It was only after the periodicity of extinction had captured the scientific imagination that Planet X was included as a possible culprit by Daniel Whitmire and John Matese. The orbit of such a planet, it was argued, would be so highly elliptical that it, too, would tend to pull material out of the Oort cloud with the same results as the proposed Nemesis and Milky Way theories. [3] Robert Harrington was so certain of the planet's existence that he went "so far as to paint a description of the suspect, and it is no pedestrian planet."[4]

> "It is three to five times the mass of the earth, is gaseous like Jupiter, has an orbit that is elliptical rather than circular and inclines to the plane of the solar system at an angle of perhaps 30° or more; its year (the time it takes to orbit the sun once) is 800 to 1,000 earth years long."[5]

It was as good as if he had already found it.

And the major problem with *this* theory is that any planet massive enough to pull matter out of the Oort cloud would be able to do so all the time and thus create a continual bombardment on Earth.[6] The best that can be said about Planet X is that it won a prominent place in William Corliss' atlas of weird science,[7] which, needless to say, did not stop astronomers from continuing to look for it.[8]

One other problem with all three theories that seems to have been glossed over is that the disruption of the Oort cloud would, as the theories themselves state, end up in a cometary shower. What, then, of the heated debate that favored asteroidal over cometary impacts as the cause of dinosaurian extinction?

DISPARITY AMONG INTELLECTS: THE GREAT DEBATE

The periodicity of extinctions and the proposed causes for this periodicity were not the only aspects of the impact theory that came under attack. The impact theory itself raised many objections to counter the evidence in its favor. Never mind whether whatever impacted at Chicxulub was the culprit responsible for the demise of Earth's dinosaurian creatures, there were many who continued to believe that no impact was to blame. It is not that impacts did

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[1] F. Warshofsky, *Doomsday: The Science of Catastrophe* (N. Y., 1977), pp. 30-31.

[2] *Ibid.*, p. 32.

[3] B. Rensberger, "Mass Extinction: What Happened to the Dinosaurs?" *Science Digest* (October 1985), p. 38.

[4] N. Angier, *loc. cit.*

[5] *Ibid.*

[6] B. Rensberger, *op. cit.*, p. 39.

[7] W. R. Corliss, "The Year in Weird Science," *Discover* (January 2000), p. 65.

[8] K. A. Svitil, "One of Our Planets is Missing," *Discover* (October 2001), pp. 74 ff.

not take place. Just about everyone accepted that much—*although what it was that actually impacted remains an open question.*

What was, and is still being, objected to is that impacts on their own could have really been responsible for the extinctions. As Gould noted, the impact hypothesis was "subjected to two general criticisms of markedly different type" from just about day one. There were "doubts that an asteroid represents the best extraterrestrial scenario and doubts that an extraterrestrial impact is required at all."[1]

This was especially so when it came to the extinction of the dinosaurs. Various voices rose in unison claiming that the extinction was not one that occurred abruptly, regardless of how relatively one views abruptness.

Leo Hickey, for one, could not envision how some plants could have survived the Cretaceous-Tertiary impact, especially since, according to him, "only rarely did plants and dinosaurs become extinct at the same time."[2] Besides, according to Alfred Fischer, a number of Cretaceous fauna "were already on a downhill slide at the time of the mass extinctions, and some stocks had already begun to die out."[3] Moreover, critics pointed to "the many species that survived the catastrophe: flowering plants, small vertebrates, freshwater plants and animals, as well as some marine species."[4]

The dinosaurs themselves, it has been argued, had been suffering a long decline throughout the later Cretaceous and that the impact, if it occurred, could only have wiped out the last few lingering species. Tim Berra, among others, was quite positive that the "extinction of the dinosaurs and many other groups took place not instantly, but over a period of several million years."[5]

> "...data from western North America indicate that the extinction of the dinosaurs was a gradual process that lasted at least 7 million years, and that the final local extinction occurred about 40,000 years after the postulated asteroid impact. This argues against the comet or asteroid hypothesis as a major cause of extinction."[6]

Others, of course, did not agree, claiming instead that, on the contrary, the dinosaurs were still on the rise during the time in question.[7] Dale Russell, for instance, has argued that "evidence of a long-term decline in the diversity of dinosaurs before the time of extinction is simply not available."[8] Even William Clemens' view that dinosaurs at a site in Alberta, Canada, "had apparently perished before the iridium anomaly" was countered by Walter Alvarez him-

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[1] S. J. Gould, "Of Dinosaurs and Asteroids," *1982 Yearbook of Science and the Future* (Chicago, 1981), p. 130.

[2] "Dinosaur Extinction Theory Rebutted," *GEO* (November 1981), pp. 125-126; see also P. Hoffman, "Asteroid on Trial," *Science Digest* (June 1982), p. 62; R. Jastrow, "The Dinosaur Massacre: A Double-Barreled Mystery," *Science Digest* (September 1983), p. 51.

[3] G. Alexander, "Going, Going, Gone," *Science 81* (May 1981), p. 68.

[4] *Ibid.*

[5] T. M. Berra, *Evolution and the Myth of Creationism* (Stanford, California, 1999), p. 17.

[6] *Ibid.*, p. 18.

[7] S. J. Gould, *op. cit.*, p. 132.

[8] P. Hoffman, "Asteroid on Trial," *Science Digest* (June 1982), p. 62.

self who offered the opinion that "the fossils Clemens found are too close to the iridium for them to be unrelated."[1]

Five years into the twenty-first century, Paul Olsen was still confessing that "deep in [his] heart," he was "quite ambivalent about whether an asteroid was involved."[2] As Mark Norell noted, "everybody agrees that an asteroid hit, but its role in the extinctions is being questioned."[3]

It was definitely questioned by Peter Ward, hailing from Washington University in Seattle, who was adamant that most mass extinctions "were caused by gradual climate change" due to extensive multiple volcanic eruptions, "rather than catastrophic asteroid impact."[4] But, according to Zeeya Merali, so many paleontologists disagreed with Ward that the dispute was on the verge of "turning into full-scale academic brawl."[5]

Another area in which the iridium layer was found to be some "ten feet above the highest dinosaur remains" was the Hell Creek-Tullock formation in Montana. This, too, seemed to be an indication that, at least in Montana, the dinosaurs disappeared before the occurrence of the impact[6]—a situation that raised its own controversy with many an argument, both for and against, the validity of the evidence and what it might really mean.[7]

This was then countered by the supposition that the impact would have triggered a massive landslide in the Gulf of Mexico which may have mixed older fossils with the debris, thus explaining why evidence for the exact timing of the event has not always been precise.[8] And if this transpired close to the Chicxulub Crater in the Gulf of Mexico, might not landslides have been triggered elsewhere with the same results? Besides, as Luann Becker pointed out, the "extreme climate perturbations" brought about by the vast quantities of debris ejected into the atmosphere by an impact would still take "a few thousand years" to kill off the entire dinosaurian population.[9]

The iridium abnormality also came into question. But most of the objections were rightly put to rest with the discovery that the anomaly exists all over the world including oceanic depths.[10] Others, however, persisted in their disagreement. John O'Keefe thought that the iridium in the sediments came from microtektites which were ejected from lunar volcanoes. Those microtektites that did not reach Earth's surface, according to him, would have orbited our planet, eventually forming equatorial rings which would have blocked the sunlight, thus

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[1] *Ibid.*

[2] C. Zimmer, *loc. cit.*

[3] *Ibid.*, p. 39.

[4] P. D. Ward, "Impact from the Deep," *Scientific American* (October 2006), pp. 64 ff.; Z. Merali, "Climate Blamed for Mass Extinctions," *New Scientist* (August 1-7, 2006), p. 18.

[5] *Ibid.*

[6] J. D. Archibald, *Dinosaur Extinction and the End of an Era* (N. Y., 1996), p. 45.

[7] *Ibid.*, pp. 45-47, 141; see also E. Dobb, "What Wiped Out the Dinosaurs?" *Discover* (June 2002), pp. 36 ff.

[8] *New Scientist* (April 18, 1998), p. 23.

[9] L. Becker, "Repeated Blows," *Scientific American* (March 2002), p. 79.

[10] S. J. Gould, *op. cit.*, p. 131.

causing the extermination of plants and animals. To be sure, however, O'Keefe's theory engendered few supporters.[1]

Dewey McLean, on the other hand, was of the opinion that the iridium layer could have resulted from volcanic activity in India.[2] What McLean based this on, of course, was the lava outpourings of the Deccan Traps.

Robert Reynolds and Michael Rampino were among those who pointed out that "ashes hurled into the air in volcanic eruptions are sometimes quite rich in iridium." And: "Since the time at which the dinosaurs disappeared was a time of frequent volcanic eruptions, they suggested that the iridium in the [Cretaceous-Tertiary] layer could have come originally from volcanoes."[3]

This was not an off-the-cuff objection since such a state of affairs had already been documented. Particles launched into the atmosphere by the eruption of the Kilauea volcano in Hawaii in January 1983 were found to contain as much as "a million times more iridium than normal."[4] This disclosure compelled William Zoller and his colleagues from the University of Maryland to support McLean's hypothesis.

Even so, with so many volcanoes erupting the world over at more or less the same time, a cause would have to be found to account for the eruptions. And, in that case, why not an impact and the geologic disturbances it would have caused? After all, as Bruce Bohor of the U. S. Geological Survey countered, the shocked quartz associated with the iridium anomaly definitely points to a high impact event.[5]

What at first appeared worse were further discoveries at Gubbio by Forese Carlo Wezel who was then the director of the geological institute at the University of Urbino. Wezel went so far as to charge the Alvarez team with having "incomplete information on rare mineral deposits in the mountains near Gubbio." More recent discoveries had apparently brought to light "even higher levels of iridium in Gubbio clay" that had been "deposited long before and after the extinction of the dinosaurs."[6] But in view of the later extension of the impact theory to cover extinctions in eras both before and after the Cretaceous catastrophe, this new discovery was more in keeping with than against the Alvarez hypothesis.

Further uncertainties introduced into the theory came from the fact that known impact craters did not always reveal a high level of iridium. Such, for instance, is the case with the melt rock of the Manicouagan Crater which contains very low iridium concentrations.[7] On the other hand, high iridium concentrations have been found in sediments which do not correspond to any known extinctions.[8]

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[1] P. Hoffman, *op. cit.*, pp. 60-61.

[2] E. Maggio, "Too Hot to Trot," *Science Digest* (June 1982), p. 63.

[3] R. Jastrow, *op. cit.*, p. 53.

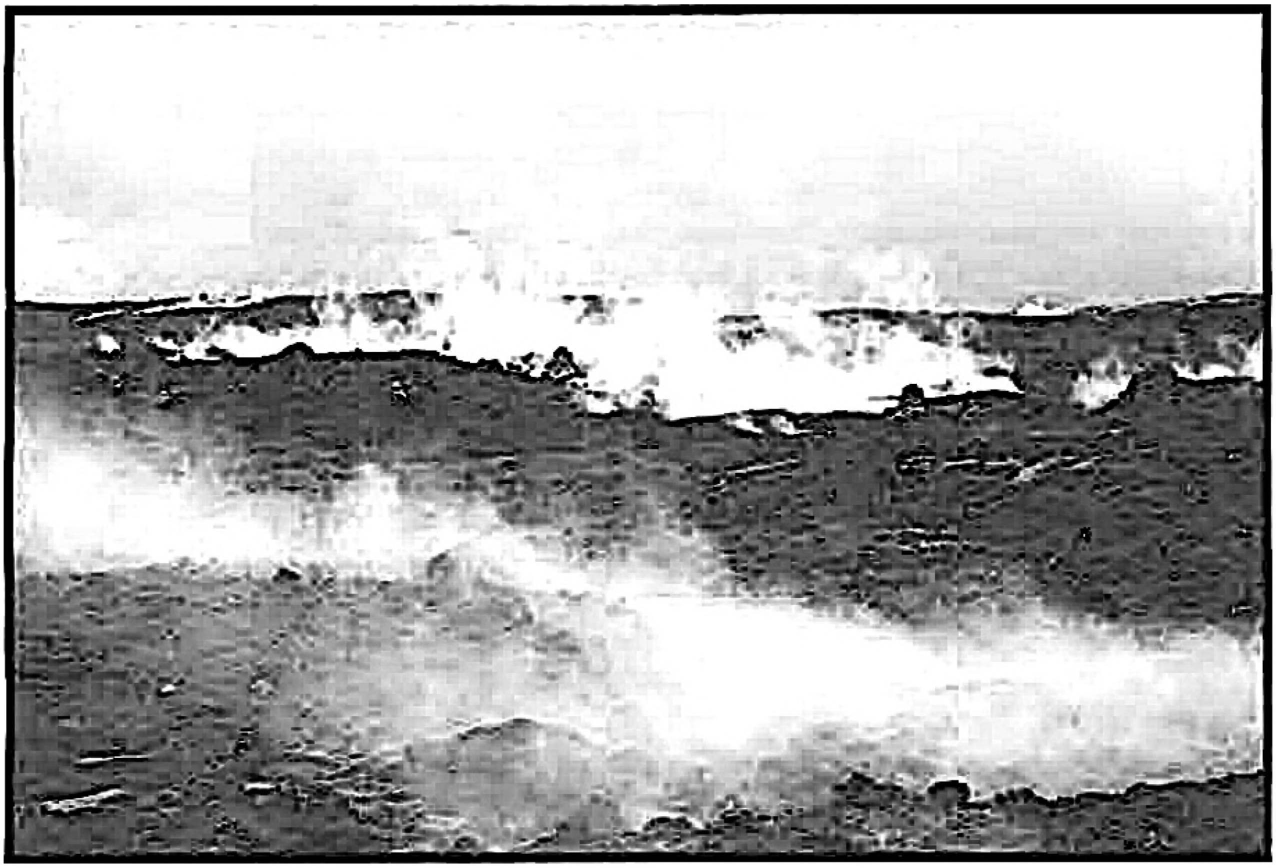
[4] P. Tisdall, *op. cit.*, p. 98.

[5] *Ibid.*; see also "Shock of Impact," *Scientific American* (July 1987), pp. 22-23.

[6] UPI wire, "Dinosaurs not Destroyed by Meteor, Geologists Say," *Ottawa Citizen* (November 25, 1981).

[7] C. J. Orth, "Geochemistry of the Bio-Event Horizons," in S. K. Donovan (ed.), *Mass Extinctions: Processes and Evidence* (London, 1989), pp. 37-72.

[8] T. Palmer, *Catastrophism, Neocatastrophism and Evolution* (Nottingham, 1992), p. 56.



The January 1983 eruption of the Kilauea volcano in Hawaii produced as much as a million times iridium than normal.
Shown above: The steaming plain beyond Kilauea's rim.
(Photograph by the author.)

And also, as C. Labandiera indicated, insects, especially leaf-eating insects, wood-boring insects, and pollinating insects, did not disappear at the end of the Cretaceous.[1] "If...the event was followed by months of dark and choking smoke," wrote Bill Bryson, "then many of the insect survivors become difficult to account for."[2]

So, likewise, P. Whalley who wrote of the lack of evolutionary change in insects across the Cretaceous-Tertiary boundary.[3] And how would such insects, thriving on trees and other plants, have survived the global fires that have been theorized on the evidence of a world-wide layer of soot? And yet, Canadian and British researchers might have found the answer to that particular dilemma. In surveying six sites in North America, they found no sign of the

[1] C. C. Lanandiera, "Diets, Diversity, and Disparity: Determining the Effect of the Terminal Cretaceous Extinction on Insect Evolution," from a talk given at the Chicago NAPC meeting—see *Fifth North American Paleontological Convention: Abstracts With Programs* (Special Publication of the Paleontological Society) 6, 174.

[2] B. Bryson, *A Short History of Nearly Everything* (Canada, 2004), p. 346.

[3] P. Whalley, "Insects and Cretaceous Mass Extinction," *Nature* 327 (1987), P. 562.

tell-tale soot, leading them to doubt the global extent of the firestorm said to have been triggered by the impact.[1]

Turning their attention to deep sea cores, Charles Officer and Charles Drake reached the conclusion that "the extinction of marine organisms occurred 200,000 years later than the formation of the iridium layer."[2] But not only marine organisms. Everett Lindey and his colleagues came to a more disturbing conclusion: that "dinosaur bones do not disappear when the iridium layer appears." On the contrary, according to them, dinosaurs persisted "long after the formation of the layer."[3] And since the iridium layer is supposed to be sandwiched between the Cretaceous and the Tertiary strata—*with nothing else between them*—this would mean that the dinosaurs actually made it into the Tertiary period. What, then, becomes of Dale Russell's previous avowal that "not one dinosaur skeleton has been found" in "the rocks that were formed immediately after the Cretaceous"?[4] And, let us face it, as Robert Sloan was to point out, dinosaurian remains have been discovered in Chinese sediments that are said to have been laid down *after* the hypothesized impact at the end of the Cretaceous. Some dinosaurs *had* apparently survived, some say for at least a million years, into the Tertiary period. And, on the heels of this report, other paleontologists started reporting similar evidence from India, Peru, New Mexico, and the Pyrenees, to say nothing of Montana, Wyoming, and Alberta.[5]

As far as Robert Jastrow was concerned, that was the end of the impact theory. "The asteroid theory was very attractive because it explained so much in a simple way," he wrote, "and many people will regret its passing."[6] The only problem was that "its passing" did not come to pass. Instead, as the debate raged on, it descended into personal rancor which did nothing but increase the clouding of the scientific issue. As reported in *The New York Times*:

> "Scientists on both sides of the argument agree that [the debate] has taken an unusually harsh and personal turn...The debate has crystallized into a conflict between opposing camps whose partisans rarely seem to change their minds or soften their position whatever the objective evidence may be.
>
> "'Lacking conclusive evidence one way or the other' said one scientist, 'opponents in this debate have been reduced to name calling.'
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> "Charges and recriminations have also flowed through the informal grapevine that can make or break scientific careers. The bitterness of the debate is so much more intense than usual that several historians of science have begun detailed examinations of the sociology of the debate.

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[1] C. Zimmer, *op. cit.*, p. 39.

[2] R. Jastrow, *loc. cit.*

[3] *Ibid.*, pp. 53, 109.

[4] D. A. Russell, "The Mass Extinctions of the Late Mesozoic," *Scientific American* (January 1982), p. 58.

[5] N.Y. Times News Service, "Recent Evidence Suggests Dinosaurs Lingered Longer," *The Vancouver Sun* (November 15, 1986), p. B6.

[6] R. Jastrow, *op. cit.*, p. 109.

> "All this ill will is a reflection of the deep disagreements among scientists over a crucial aspect of the Earth's history. But the personal venom in the debate, some scientists fear, is inhibiting rational scientific discourse."[1]

Charles Officer, Tony Hallam, and Dewey McLean have been reported to have said that the impact theory achieved prominence not only because of its exciting appeal but also because Luis Alvarez was a Nobel laureate with tremendous scientific clout. And Alvarez himself threatened to wreck McLean's career while orchestrating a violent campaign to discredit him.[2]

In the end there were those who argued that impacts alone would not have been enough to finish off the dinosaurs.[3] (Unfortunately, some of the proposed alternatives leave even more to be desired.[4]) New drilling at Chicxulub indicated that the crater was not as large as it had been believed and that the impact that created it was unlikely to have been the sole cause of the extinction.[5] Others argued that "the mass extinction at the time may not have been as massive as previously thought."[6]

In time it was pronounced that the Chicxulub impactor was itself only a fragment that had been created by a collision between two bigger bodies 160 million years ago. The larger of the two, 170 kilometers [106 miles] in diameter, is said to have slammed into another body 60 kilometers [37 miles] across, creating a new family of asteroids which has been dubbed the Baptistina family. It was, according to this view, a meteorite from this family, 10 kilometers across, which struck Mexico's Yucatan Peninsula 100 million years later.[7] The Baptistina family of asteroids, they dared tell us, had "originally included about 300 rocky bodies larger than six miles (10 kilometers) across and 140,000 objects larger than 0.6 miles (1 kilometer) across.[8] As I have often said of similar reports, the precision of such statistics, especially when it comes to number, size, and dating, never fails to amaze me. Heavens—they could even tell the collision occurred vertically in relation to the Solar System's equatorial plane![9] Of course, to be sure, all of this was reliant on a series of computer models and "[did] not represent a firm conclusion" even though they were reported to be "supported by information collected from the Chicxulub crater by past researchers."[10]

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[1] *The New York Times* (January 19, 1988), p. 1C.

[2] "Scientific Maffia Strikes Again," *Chronology & Catastrophism Review* (1996:2), p. 31.

[3] E. Dobb, *op. cit.*, p. 38; R. M. Gorman, "Extinction Trends: No Need to Fear the Asteroids?" *Discover* (February 2003), p. 11.

[4] See for instance, F. Barbiero, "Changes in the Rotation Axis after Asteroid/Cometary Impacts and their Geological Effects," *Proceedings of the Symposium Fifty Years After Worlds in Collision by Velikovsky: Classical and New Scenarios of the Evolution of the Solar System* (Bergamo, 2002), pp. 86 ff.

[5] *Science Frontiers* (January/February 2004), p. 3.

[6] E. Dobb, *op. cit.*, p. 40.

[7] "New Look at Dinosaurs' Demise," *TIME* (Canadian Edition, September 24, 2007), pp.14-15.

[8] J. Bryner, "Dino-Killing Asteroid Traced to Cosmic Collision," *SPACE.com* (September 5, 2007).

[9] *Ibid.*

[10] *Ibid.*

It was even stated that "planets and moons, including our own, regularly exchange large quantities of material flung into space by asteroidal impacts."[1]

> "The most famous of such impacts on Earth happened 65 million years ago, at the end of the Cretaceous period, and was almost certainly responsible for the demise of the dinosaurs. From what we know about the violence of that event, it seems reasonable to assume that asteroids crashing into Earth can indeed fling material into space."[2]

This was echoed in an *Icarus* article which claimed that while most of the material from the Chicxulub impact fell back to Earth, "an appreciable quantity" was propelled into space. And while some of this material might still be out there, some of it would have landed on Mars, Venus, and even Mercury. The largest quantity of this space-borne debris, however, is probably to be found on the Moon.[3]

All of these theorists failed to reckon with Gerta Keller, a stratigraphic palaeontologist from Princeton University, and her colleagues who were accumulating "data and evidence from more than 100 localities [later upped to 200][4] that simply did not fit the K-T impact theory" for the demise of the dinosaurs. Keller's findings indicated that the impact which created the Chicxulub Crater occurred 300,000 years before the dinosaurs died out. Samples from a new core drilled within the impact site revealed that the impacted glassy spherules from the crater, as well as other localities in Central America, were actually imbedded in a stratum that predated the K-T mass extinction by that amount of years. Detailed analysis of micro-organisms lent further credibility to the date.[5] Worst of all, *no iridium has ever been found in association with the Chicxulub crater itself.*[6]

> "These results were confirmed by other studies conducted throughout Mexico, Guatemala and Haiti, which exposed signs of as many as three meteorite impacts: the Chicxulub impact; the K-T impact with its iridium layer and mass extinction; and a third smaller impact, evidenced by another iridium layer about 100,000 years after the extinction."[7]

As for Keller herself, she did not originally dispute that an impactor could have helped trigger the demise of the dinosaurs. She, however, remains confident that Chicxulub is not the crater scientists should be looking at. As far as she is concerned, she agrees with those others who claim that "impacts that leave Chicxulub-size craters and smaller cannot by themselves cause significant species extinctions."[8] Worse still, it even later came out that "far from being

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[1] P. Ward, "House of Flying Fossils," *New Scientist* (April 1-7, 2006), p. 38.

[2] *Ibid.*

[3] *Ibid.*, p. 39

[4] "Chicxulub Commentary—Impact Factor," *Geoscientist Online* (July 18, 2007).

[5] R. Hathiramani, "More than One Asteroid Caused the K-T Extinction," *The Daily Princetonian* (March 24, 2004).

[6] B. E. DiGregorio, "Doubts on Dinosaurs," *Scientific American* (May 2005), p. 28.

[7] R. Hathiramani, *loc. cit.*

[8] B. E. DiGregorio, *op. cit.*, pp. 28-29.

the dinosaur-killer," the Chicxulub impact "had no effect on living things at all."[1] Or whatever little effect it did have, "everything went back to normal" after the impact.[2]

As was to be expected, Keller's claims did not go uncontested. Just as landslides had been blamed for mixing up the pertinent fossils, impact-caused tsunamis were now being blamed for jumbling the debris from the impact level with fossils from other environmental levels.[3] Keller, however, remained adamant that there is no such evidence of a tsunami in association with Chicxulub.

There is more to all this than meets the eye. Richard Greenwell reminded his readers that the fall of meteorites and the drifting of continents were once anathema to science.[4] And although he wrote the following in 1982, it remained just as relevant decades later:

> "Many social psychologists say that for all intents and purposes reality is, at any given time, whatever the specialists say it is. If most of the experts say stones never fall from the sky, they don't; if these experts suddenly change their minds, stones start raining down. Does this strike you as a strange way for science to determine what is real or true? If it does, consider the debate over what caused dinosaurs to die out...Recently, two members of the American Geophysical Union proposed a 'democratic solution' to the question...Whatever hypothesis received the most votes from the Union's members should, the scientists suggested, be declared the official reality!"[5]

Which cannot help remind one of the similar situation when, in August of 1950, the British Association for the Advancement of Science met in order to vote for the acceptance or rebuttal of the continental drift theory. The vote came in even, but the theory was discarded just the same, thus setting geology back by almost a decade, until revived by S. W. Carey at a symposium that was held at the University of Tasmania.

Despite all the uncertainties raised by newer evidence, that "asteroid impacts killed off the dinosaurs, and ended the Cretaceous, Triassic, and Jurassic geological periods" continued to be preached into the twenty-first century.[6] Even the Chicxulub Crater was still being presented as the scar from the impact that destroyed the dinosaurs,[7] despite those who found newer axes to grind.[8]

A new terrestrial wound, championed by Sankar Chatterjee, for instance, had by then risen to the challenge. This was the Shiva Crater, a depression with a central peak, that scars the bottom of the Indian Ocean west of Mumbai. Somewhat tear-drop shaped, the crater measures

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[1] "Chicx Comes Home to Roost," *Geoscientist Online* (June 18, 2007).

[2] *Ibid.*

[3] *New Scientist* (February 12, 2004), p. 15.

[4] J. R. Greenwell, "The Dinosaur Vote," *Science Digest* (April 1982), p. 42.

[5] *Ibid.*

[6] P. E. Gay, "Killer Asteroids Make Big Splash," *Astronomy* (February 2003), p. 28.

[7] K. Ravilious, "White-Knuckle Planet," *New Scientist* (July 16-22, 2005), p. 35.

[8] B. E. DiGregorio, "How to Survive an Asteroid," *Discover* (September 2007), p. 15.

600 by 400 kilometers and has been calculated to have been gouged by a meteorite 40 kilometers across.[1]

In the end it came close to being conceded that the mass extinction might have been due to multiple causes and that "the real story behind the dinosaur-ending disaster is more complicated and as yet unclear."[2] But "close" is only good in the game of horseshoes. Somewhat surprisingly—at least to some—there was still "widespread agreement that the Cretaceous extinction, which wiped out the dinosaurs 65 million years ago, was triggered by an asteroid impact."[3] Exotic theories, after all, do not die easily. By the end of 2007, an asteroid was still nonchalantly being proclaimed to have "doomed the dinosaurs."[4] Not only that, but the impact in question was still being claimed by most to have been the one that carved out the Chicxulub crater.[5]

As of this writing, that is more or less where this complicated mess stands. The investigation of course continues and it is almost certain that by the time this work sees the light of publication, further disclosures would have come to hand. But at least the above does indicate what transpired in the geological and paleontological fields once iridium bestowed its stamp of endorsement on the impact theory. In the end, not only extinctions, but the very inception of life on Earth was to become associated with cosmic impacts—as note the following:

> "That impact events may play an extremely important role in the modern history of life on Earth seems clear; but the impact rate was much higher in the distant past. To what extent has the origin, stability, and fate of life on Earth been regulated by impacts?...early impacts, like other high-energy processes such as ultraviolet light, cosmic ray irradiation, and lightning discharges, support the production of the essential components of life."[6]

One more thing the Chicxulub impact was eventually blamed, or blessed, for is the creation of Mexico's richest accumulation of fossil fuel—the giant Cantrell oil field—in the Gulf of Mexico off the Yucatan. The impact is now said to have fractured the basement bedrock allowing the oil in Earth's mantle to seep into the sedimentary rock from which it can be pumped.[7] However, as honestly confessed, how the sedimentary rock in question is supposed to have reached below bedrock "is another question."[8]

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[1] S. Chatterjee, *et al.*, "Shiva Structure: A Possible KT Boundary Impact Crater on the Western Shelf of India," *Special Publications [of the] Museum of Texas Tech University* (October 2, 2006), *in toto.*

[2] J. N. Wilford, "Rethinking What Caused the Last Mass Extinction," *The New York Times* (November 6, 2007).

[3] Z. Merali, *loc. cit.*

[4] A. Lawler, "What to do Before the Asteroid Strikes," *Discover* (November 2007), p. 62.

[5] Space.com Staff, "Killer Space Rock Theory is Soaking Wet," Space.com (January 24, 2008).

[6] J. S. Lewis, *Rain of Iron and Ice* (N. Y., 1996), p. 113.

[7] J. Corsi, "Impact Craters, Fossil Fuel and Peak Oil," *worldnetdaily.com* (November 16, 2005).

[8] *Ibid.*

COSMIC RAY BOMBARDMENT

The Solar System's undulating motions through the galaxy did not only involve the System's travels from one galactic arm into another. Our Sun's family of planets is also dragged up and down across the galactic plane. When that transpires, the Solar System temporarily moves out of the Galaxy's protective disk, leaving it more exposed to cosmic rays. One of these bobbing cycles has been calculated to take 64 million years which, to some, was close enough to the 62-million-year periodicity others had been vouching for Earth's mass extinctions through the ages.[1] Yes, that's correct. Whereas, as we noted on an earlier page, this supposed periodicity had formerly been calculated as anywhere between 25 and 35 million years, it had by 2007 increased to 62 million years. But the objections that had been raised against the previous shorter periods are just as potent against this longer duration—or hadn't anyone noticed?

Of course the main theoretical motive behind the Solar System's bobbing up and down as the means by which mass extinctions came to be periodically initiated was to allow enough cosmic rays to bombard Earth and its vulnerable life forms.[2]

> "The boost in cosmic-ray exposure could have both a direct and indirect effect on Earth's organisms...The radiation could lead to higher rates of generic mutations in organisms or interfere with their ability to repair DNA damage, potentially leading to diseases like cancer.
>
> "Cosmic rays are also associated with increased cloud cover, which could cool the planet by blocking out more of the Sun's rays. They also interact with molecules in the atmosphere to create nitrogen oxide, a gas that eats away at our planet's ozone layer, which protects us from the Sun's harmful ultraviolet rays."[3]

Even those who found the theory interesting thought it wise to preach caution. And yet there was truth, if nothing new, to what Bruce Lieberman stated in that "it's not just the climate and the tectonic events on Earth" that should occupy our studies. "Maybe we have to start thinking more about the extraterrestrial environment as well."[4]

What Lieberman had in mind was an entirely different kind of radiation. As he had noted two years earlier, Earth's ozone layer could also have been depleted by a 10-second burst of gamma rays. And the mass extinction of the Ordovician, 450 million years ago, when 60% of the then predominant marine invertebrates were exterminated, was blamed on just such a burst.[5] Although gamma ray discharges are rare, they are the most powerful explosions we know of in the Universe. Their rare occurrence, however, is not the only drawback to the the-

[1] K. Than, "Out-of-this-World Hypothesis: Cosmic Forces Control Life on Earth," *Space.com* (April 23, 2007).
[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*
[5] "Gamma Ray Burst is Mass Extinction Suspect," *BBC News Online* (April 11, 2005)

ory of mass extinction. Their distance, too, must be considered. Such a burst would have to have been within 6,000 light years from Earth for it to have had a devastating effect on life.[1] But the two theorized causes of gamma rays—stellar collapse into a black hole and/or the collision of two neutron stars[2]—have not been detected that close to Earth. In fact, let's be honest: Although such events have been theorized, they have not been detected anywhere.

A better candidate for the close emission of cosmic rays would be nearby supernovae. And that a stellar outburst, if not more than one, has taken place close enough to Earth to cause drastic annihilations of life remains a theory that refuses to go away.[3]

THE SUPERNOVA CHALLENGE

It is no secret that when the Alvarez team realized that the iridium layer from Gubbio had to have had a cosmic source, their first extraterrestrial suspect was neither an asteroid nor a comet. What they first thought of, and widely publicized, was that the iridium anomaly was "evidence that a supernova had wiped out the dinosaurs."[4] This was understandable because the supernova theory for Earth's past mass extinctions was already in vogue at that time. This theory, of course, relied on the fatal radiation that is believed to be expelled from stellar flare-ups. And the suggestion that a burst of cosmic radiation had been responsible for ending the Cretaceous period goes at least as far back as the 1920s.[5] Moreover, radiation was not only discussed in relation to extinctions, but also in its possible relevance to evolution. Since life had for long been thought to have evolved as a result of random mutations in hereditary characteristics, the reasoning went something like this:

> "Ionizing radiation [such as X-rays and gamma rays] produces mutation. Ergo, ionizing radiation is an important cause of evolution."[6]

But as James Crow revealed, it is not all that simple, as detailed studies and experimentation conducted at the end of the 1950s implied.

> "The general conclusion [wrote Crow] is that ionizing radiation is probably not an important factor in animal and plant evolution. If it is important anywhere it is probably in those species, such as man, that have a long life span, and at least for man it is a harmful rather than a potentially beneficial factor."[7]

That and similar disclosures did not kill the mutation-by-radiation theory,[8] as neither did it eliminate the association of supernovae with the evolution and extinction of life on Earth.[1] On

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[1] *Ibid.*

[2] *Ibid.*

[3] M. A. Garlick, "The Supernova Menace," *Sky & Telescope* (March 2007), pp. 26 ff.

[4] "Asteroid Blamed for Dinosaurs' Extinction," *Chemical and Engineering News* (April 14, 1980), p. 25.

[5] T. Palmer, *op. cit.*, p. 29; see also *Flare Star*, p. 472.

[6] J. F. Crow, "Ionizing Radiation and Evolution," *Scientific American* (September 1959), p. 138.

[7] *Ibid.*, p. 160.

[8] F. Warshofsky, *op. cit.*, p. 121.

the contrary, astronomers were eventually to come face to face with the fact that some of the compounds that are formed through the outbursts of supernovae constitute the raw materials from which life on Earth originated.[2] When it came to extinction, on the other hand, radiation proved more of a problem. One of these involved marine organisms since these should have been shielded from even "a massive increase in cosmic radiation" by the seawater in which they thrived.[3] As already noted, however, supernovae-induced radiation can diminish, if not destroy, Earth's ozone layer,[4] and this could have atmospheric consequences that would affect the environment both on land and in the sea. Such environmental changes, on the other hand, would have been relatively slow and, while these might have resulted in some gradual biotic deaths, it is doubtful that they would have caused the sudden extinction of entire species. On the other hand, it has also been conjectured that radiation would have affected animals more severely than plants,[5] which might account for the survival of some vegetation at the Cretaceous-Boundary event.

By 1979, despite all the above, the supernova theory for the extinction of the dinosaurs was still being advertised as "the closest to being accepted."[6] And although the astronomical distances of these stellar instabilities had always been something of a drawback, scientists like Dale Russell, who then hailed from the National Museum of Natural Sciences in Ottawa, could not quite give up the theory. True—past supernovae were not known to have transpired close enough to have a significant effect on Earth. But that a supernova could occur within 100 light years once every 50 million years, it was reasoned, was a statistical probability. At that relative close range—and I stress "relative"—its energy would be enough to disrupt our protective atmosphere and shower Earth with cosmic rays.[7]

> "Exactly this seems to have happened at the death of the dinosaurs. Dinosaurs and large flowering plants, highly evolved and vulnerable because of their size, would be initially devastated by radiation, while smaller plant-forms and more primitive creatures would remain unaffected."[8]

While the above was seen as being somewhat simplistic, as in actuality it still is, the supernova theory held on. At times variations were introduced. One of these, proposed by a group of specialists in atmospheric science headed by George Reid, advocated that Earth "could pass through the cloud left by a supernova...about once every 100 million years."[9]

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[1] See for instance L. J. Salop, "Glaciations, Biologic Crises and Supernovae," *Catastrophist Geology* 2:2 (1977), pp. 22-41; "Cosmic Radiation Blast Linked to End of Dinosaurs," *New York Times* (May 30, 1979), p. A20.

[2] F. Warshofsky, *op. cit.*, p. 138.

[3] *Ibid.*, p. 208.

[4] W. McCrea, *et al.*, *Nature* 265 (1977), p. 318.

[5] K. D. Terry & W. H. Tucker, "Biologic Effects of Supernovae," *Science* 159 (1968), pp. 421-423.

[6] F. Hitching, *The World Atlas of Mysteries* (London, 1979), p. 12.

[7] *Ibid.*, p. 13.

[8] *Ibid.*

[9] A. Fisher, "Science Newsfront: Supernovas and Dinosaurs," *Popular Science* (February 1979), p. 10.

"Such clouds, such as the Crab Nebula, are thought to be the sources of intense cosmic radiation. The...scientists [mentioned above] calculate that the earth, moving through the cloud, would be bombarded by from 100 to 1000 times the cosmic barrage our atmosphere is subjected to normally."[1]

This variation, however, does nothing to circumvent the distance problem since the distance Earth has to travel to reach a supernova's "cloud" of radiation before it can pass through it is no different than the distance a supernova's radiation has to travel to reach Earth. This is probably the main reason why Luis Alvarez gave up on the theory because, according to his calculations, a supernova would have had to have been a mere 0.1 of a light year away for it to have transferred the amount of iridium his son had discovered in the Gubbio clay. Had it been that close, still according to him, it would simply have killed all life on Earth. Besides, had it been a supernova, the iridium isotopes should have been different from Solar System averages, while they should also have been accompanied by plutonium-244. At least that was his reason for shifting his attention from a supernova to an asteroid.[2]

What was apparently glossed over is that concentrations of high uranium have also been found in dinosaur bones from the late Cretaceous.[3] As Nigel Calder noted, there were still some "experts" who were "not yet satisfied that the exploding-star hypothesis, which might account for both the origin of the iridium and the death of so many plants and animals, has been completely excluded."[4] Among these were Jan Smit and J. Hertogen who were not perturbed too much by the fact that the ratio of the rare elemental isotopes from the Cretaceous-Tertiary boundary is very similar to Solar System ratios. Although, even in their own opinion, the chances of finding a similar ratio in interstellar matter is rather low, they did not consider it impossible. What seemed rather strange is that they found it more favorable to focus on a distant, rather than a nearby, supernova.[5]

As time went by, the discordant, when not contradictory, reports added nothing to the controversy beyond confusion. Thus, for instance, supernovae were dismissed as being too rare to receive serious consideration.[6] But on the heels of this avowal—and in the same scientific periodical no less—came the revelation that supernovae occur more frequently than hitherto supposed.[7] As I usually say in such instances: Go figure!

In fact it has been estimated that a supernova takes place, on average, once every 50 years, although, to be sure, most of these occur too far away to do any harm on Earth.[8]

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[1] *Ibid.*

[2] "Asteroid Blamed for Dinosaurs' Extinction," *Chemical & Engineering News* (April 14, 1980), p. 25; N. Calder, *op. cit.*, p. 134.

[3] *Nature* 214 (1967), pp. 161-163.

[4] "Asteroid Blamed for Dinosaur Extinction" (see above), p. 136.

[5] J. Smit & J. Hertogen, "An Extraterrestrial Event at the Cretaceous-Tertiary Boundary," *Nature* (May 22, 1980), pp. 198-200.

[6] *New Scientist* (June 9, 1983), p. 704.

[7] *New Scientist* (June 16, 1983), p. 776.

[8] K. Ward (ed.), *Great Disasters* (N. Y., 1989), p. 14.

"However, about once every 50 million years a supernova occurs close enough to the earth to deliver a radiation dosage of perhaps 500 roentgens (nearly 17,000 times greater than the normal upper atmospheric levels). Statistically then, there would have been more than enough time for a supernova to wreak havoc in our galaxy."[1]

Thus, as can be seen, despite all the hubbub that was raised by the asteroid impact theory popularized by the Alvarez team, the supernova hypothesis kept rearing its stubborn head.[2] Variations on this common theme also continued to proliferate. Malvin Ruderman and James Truran, Jr., for instance, proposed that the gamma rays from a stellar explosion "could have blown micrometeoritic material off the surface of the moon and the earth could have swept it up." But even they had to admit that "the transfer of iridium to the earth by such a mechanism would probably fall short of the required amount."[3] The strange part of all this is that, with so many objections raised against it, the theory should have simply faded, if not entirely fallen, out of favor. Yet its obstinacy held on tenaciously. Even when it was acknowledged to be in disrepute, the literature continued to fan its flames, as the following excerpt from a popular publication indicates:

"The ground-level radiation [released by a supernova] might have been sufficient to kill the dinosaurs or induce a slow, cancerous death. It might very well have rendered the dinosaurs sterile or caused dramatic mutations in their offspring, making them doomed misfits in their environment. And such an explosion also might have altered the heat-retaining capacity of the atmosphere, so that the earth would have been plunged briefly into winter, and dinosaurs, with little or no insulating mechanism, would have been among the most severely affected."[4]

That the dinosaurs had fallen victim to cancer, which would have been caused by massive outbursts of neutrinos released by dying stars, was suggested by more than one authority.[5] Still others were of the belief that life extinctions were caused by "jets of cosmic rays coming from the collapse of neutron stars or the merger of two such stars [which] could initiate a lethal batch of muons in our atmosphere."[6] Philip Schewe and Ben Stein have argued that "the ensuing ionizing radiation [from these jets] might have affected the biosphere in two ways—by killing many species outright and by causing the sort of mutations that might result in the abrupt appearance of many new species in the aftermath of the jet event."[7] But then debris in a

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[1] *Ibid.*

[2] See here, for example, G. Alexander, *op. cit.*, pp. 65, 66; P. Warlow, *The Reversing Earth* (London, 1982), p. 90; P. Hoffman, *op. cit.*, p. 61; S. J. Gould, *op. cit.*, p. 124; *New Scientist* (July 14, 1983), p. 99; R. Jastrow, *op. cit.*, p. 51; C. Sagan, *Cosmos* (N. Y., 1983), pp. 283, 285, 322; M. D. Lemonick, "Supernova!" *TIME* (March 23, 1987), p. 65; D. A. Russell & W. Tucker, "Supernovae and the Extinction of the Dinosaurs," *Nature* (February 19, 1991), pp. 553-554; *The Guardian* (March 25, 1993), p. 13.

[3] D. A. Russell, *op. cit.*, p. 61.

[4] K. Ward, *loc. cit.*

[5] *New Scientist* (January 13, 1996), p. 17.

[6] R. Sinclair, "Life Extinction by Cosmic Ray Jets," *Internet Digest* (1998:2), p. 13.

[7] *Ibid.*

Permian stratum was said to have come from an exploded star, so it was back to the supernova theory.[1]

By the turn of the century, with the general, though by no means universal, acceptance of the Alvarez theory, the supernova hypothesis should have been laid to rest. But, as in the Alvarez theory, evidence in its favor kept coming in. Iron in ocean cores did not only lead some to conclude that Earth had suffered cosmic ray bombardment from a nearby supernova, astronomers were reported to have actually traced a source for the supernova that could have been responsible.[2] And as if that was not enough, we were officially warned that another supernova, a member of the star system known as HR 8210, could blow its head off any time, once again bringing disaster to Earth.[3]

> "If that happens [it was reported], watch out. Although it might not exactly be in our backyard, the energy released by such a supernova can ruin a neighbourhood much larger than 150 light years across. The outgoing wave of electromagnetic energy and cosmic rays could destroy Earth's ozone layer in a matter of minutes, exposing all life on the planet to lethal levels of radiation."[4]

Despite the time it would take for the radiation to travel the astronomical distance to Earth, astronomers were not exactly indifferent to it. As Francois Wesemael, who was then at the University of Montreal, told reporters: "The caution about being too close to one of these stars is certainly well founded."[5] And although by then it was widely known that high-energy ionizing radiation *can* wreck DNA, more recent experiments shows that "even remarkably low energy electrons set off by ionizing radiation can break up key molecular components of RNA and DNA."[6]

In 2003, steering clear of the term "supernova," and thus entitling themselves to a "startling new theory," Adrian Melott and his colleagues blamed the Ordovician extinction, if no other, on "death rays from outer space." The death rays they had in mind were gamma ray bursts from a collapsing star.[7]

> "Astronomers [had] so far recorded only harmless bursts coming from distant galaxies. But one occurring in the vicinity of Earth could be catastrophic. The atmosphere would cushion much of the blow, but the planet's nitrogen and oxygen molecules could be 'ripped apart'..."[8]

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[1] *Scientific American* (August 1998), p. 14.

[2] *New Scientist* (January 19, 2002), p. 17; *Ibid.* (May 25, 2002), p. 12.

[3] T. Lougheed, "Dying Star a Threat to Life on Earth, Researcher Says," *The Vancouver Sun* (May 24, 2002), p. A11.

[4] *Ibid.*

[5] *Ibid.*

[6] G. P. Collins, "Fatal Attachments," *Scientific American* (September 2003), pp. 26, 28.

[7] R. Boswell, "Death Rays from Space Caused Extinction, Scientists Say," *National Post* (September 27, 2003), p. A6.

[8] *Ibid.*

Brian Chatterton then presented the Melott team with palaeontological evidence when he told that certain kinds of Ordovician trilobites disappeared suddenly, while others did not. His studies had led him to believe that marine species inhabiting the upper levels of the ocean were the first to die out,[1] while those at greater depth would have been shielded from the radiation. This was supported by Bruce Lieberman who reported that:

> "Brian Chatterton's work is a quite important part of our study. He found that animals that live in shallow water or swim high in the water are much more likely to go extinct."[2]

It was furthermore reasoned that when such gamma rays reach Earth, they would undoubtedly irradiate only those species on one side of the terrestrial globe, while those on the opposite side would succumb later through solar ultraviolet rays admitted through the hole punched in the ozone layer by the gamma rays. Melott and his team acknowledged that "the pattern of trilobite extinction identified by Mr. Chatterton precisely matches the expected effects of a gamma-ray burst close to Earth."[3]

As if in actual cahoots with the above speculation, a burst of gamma rays actually smacked into Earth on December 27 of 2004. It came from a so-called neutron star "just 20 kilometers across" known as SGR 1806-20. The event was recorded by 14 spacecraft "and an untold number of military satellites."[4]

> "Despite its 50,000-light-year distance, SGR 1806-20's 'superflare' irradiated Earth with more total energy than a powerful solar flare...The superflare was so energetic that it saturated most of the X-ray and gamma ray detectors aboard the various spacecraft. Amateur radio solar observers easily saw its ionizing effects on Earth's upper atmosphere, even though the superflare smacked our planet on the daylight side, where it had to compete with the Sun...Gamma rays bouncing off the Moon triggered detectors on the Russian Helicon-Coronas-F satellite."[5]

"For a split second," reported Bryan Gaensler from the Harvard-Smithsonian Center for Astrophysics, "this superflare was one of the brightest objects in the history of astronomy after the Sun and perhaps a couple of spectacular comets." SGR 1806-20 was calculated to have released as much energy for two-tenths of a second as the Sun is capable of generating in 250,000 years.[6]

And yet, when compared to the energy that is let loose by a typical supernova, SGR 1806-20's vigorous output was rather paltry. Besides, a supernova's energy is usually released in the span of a few months and not, as in this case, in a fraction of a second. And then, once

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[1] *Ibid.*

[2] *Ibid.*

[3] *Ibid.*

[4] R. Naeye, "Fireworks from the Far Side of the Galaxy," *Sky & Telescope* (May 2005), p. 29.

[5] *Ibid.*

[6] *Ibid.*

again downplaying the role of supernovae, Gaensler went on record in saying that: "Most of a supernova's energy flies into space forever and never interacts with anything."[1] On the other hand, as an attempt to snuff out life on Earth, SGR 1806-20 fared no better. As it was reported: "Thanks to Earth's protective atmosphere and SGR 1806-20's distance, the superflare posed no threat to humanity or the biosphere."[2] It would, of course, have been entirely different had SGR 1806-20 been closer to Earth. These blasts of energy, it has been argued, are so strong that they are "capable—even from 3,000 light years away—of wiping out all life on Earth."[3]

> "The subsequent explosion, if close enough and aimed at us, would be so energetic as to cause a major extinction. Gamma-ray burst extinctions may have occurred already in Earth's past, for example, at the end of the Ordovician period, 440 million years ago. Luckily, such bursts are relatively rare..."[4]

As was perhaps to be expected, Gaensler's disclaimer did not prompt a graceful exit of the supernova theory. On the contrary, the belief that supernovae can and do interact with Earth continued to resurface. While this writing was in progress it was again disclosed that: "Evidence is mounting that the infant solar system was rocked by a nearby supernova." Traces of radioactive isotopes in meteorites are now believed to have been "most likely" injected "when a nearby massive star abruptly ended its brief life with a bang."[5]

THE PROTO-SATURNIAN SOLUTION

Whether one thinks of supernovae or gamma-ray-producing collapsing stars, the biggest obstacle to either of them having been responsible for Earth's past mass extinctions is the astronomical distances involved. Our theory of proto-Saturn's recurring flare-ups resolves this dilemma as, in fact, it resolves most, if not all, of the objections that have been raised against each and every theory of mass extinctions so far proposed.

Let not the fact that proto-Saturn was a mere sub-brown dwarf star stand in the way of its nomination as the cause of Earth's past upheavals. When Karin Sandstrom from Harvard University warned that a supernovae "located uncomfortably close to us" may be imminent, she had a dwarf star in mind. As noted above, she had focused her attention on the "unusual" two-star system HR 8210, located about 150 light years from Earth. As she suggested "recent observations show the larger star could soon expand, adding material to its nearby companion and causing it to explode." The "nearby companion" was described by her as "a 'dwarf' star—which is little bigger than a planet yet has a mass somewhat larger than our sun."[6] And although it was still nothing but a theoretical possibility, those who believed in Nemesis were

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1 *Ibid.*, p. 30.

2 *Ibid.*, p. 32.

3 R. Zimmerman, "A Visit to the High-Energy Zoo," *Astronomy* (January-February 2005, Special Issue), p. 42.

4 *Ibid.*

5 "Solar-System Supernova?" *Sky & Telescope* (June 2005), p. 24.

6 T. Lougheed, *loc. cit.*

finally convinced that it would be found to be nothing but a brown dwarf star—which is why the search for it began all over again.[1] More to the point, Saturn's present characteristics continue to lead astronomers to describe it as "a starlike body"[2] which, as a sub-brown dwarf, it actually once had been.

Meanwhile, dwarf stars have been theorized to change with age "to become brighter and slightly hotter while remaining the same radius."[3] Whether this brightening is a prelude to flaring has not yet been ascertained. But that dwarf stars do erupt was exhibited quite dramatically in April 24, 2004, when a dwarf in the constellation Virgo went through an abrupt surge, increasing its brightness by thousands of times—some say as much as 20,000 times—"100 times brighter, and a million times more energetic, than a solar flare."[4]

It has also been noted that astral jets "play a major role in supernovae formations, just as they do in gamma ray bursts."[5] As indicated in one of our earlier works,[6] proto-Saturn's *axis mundi*, or polar column, was an astral "jet"—a misnomer, to be sure. That jets from brown dwarfs have been detected need not be repeated.[7] And that "jets might once have gushed from planets such as Jupiter and Saturn" has eventually been recognized as a realistic possibility.[8] Evidence of the previous existence of the proto-Saturnian "jet" may even be manifested by the recent discovery of a hot spot in Saturn's present southern limit—which would have been the extremity facing Earth—in a polar area that is unaccountably warm.[9] Explained as a sustained Birkeland current, it was, as noted in our earlier work,[10] the retraction of this "jet" that supplied the final jolt which caused proto-Saturn to flare up at the end of the Pleistocene. And if this transpired at that time, it can safely be assumed that similar processes would have taken place in all previous proto-Saturnian flare-ups.

What cannot be stressed often enough is that despite the fact that proto-Saturn's flare-ups would have been nowhere as powerful as supernovae or astral superflares, their proximity to Earth would have compensated for the lesser energy involved. The imparted radiation would have had tremendously less distance to travel. It would also have been much more concentrated since it would not, at that lesser distance, have yet diffused into space. Moreover, the opacity of the plasmasphere in which the proto-Saturnian system was enveloped would have reflected whatever radiation was not conveyed poleward back to Earth.

We will let pass the claim that dinosaurs had been dying out before the Cretaceous-Tertiary boundary event since, as we have seen, there is abundant evidence which shows exactly

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[1] B. Dorminey, "Dark Threat," *Astronomy* (July 2005), pp. 41-42, 45.

[2] J. Kluger, "Secrets of the Rings," *TIME* (July 12, 2004), p. 30.

[3] K. Williams, "Stellar Lot," *Astronomy* (September 2005), p. 68.

[4] F. Reddy, "GALEX Sees Dwarf Star Superflare," *Astronomy* (September 2005), p. 26.

[5] R. Naeye, "Supernovae are not Round, Continued," *Sky & Telescope* (May 2005), p. 22.

[6] *God Star*, pp. 242 ff.

[7] See for instance, M. McKee, "Violent Jet Detected Spewing from Brown Dwarf," NewScientist.com news service (June 14, 2005).

[8] *Ibid.*

[9] "Flash," *Discover* (April 2005), p. 11.

[10] *Flare Star*, pp. 279 ff.

the opposite, that dinosaurs continued to proliferate right through the Cretaceous period.[1] But why did some dinosaurs escape radiation's lethal dose? There is no mystery here either. The two atomic bombs that were dropped on Hiroshima and Nagasaki at the end of World War Two did not kill every inhabitant of those two cities. Those at ground zero never had a chance. "The immediate causes of death from nuclear attack," wrote Carl Sagan, "are the blast wave, which can flatten heavily reinforced buildings many kilometers away, the firestorm, the gamma rays and the neutrons, which effectively fry the insides of passersby."[2] But many of those who were away from the centre of the targets escaped with their lives, if not with their health, intact. Many of the survivors lived for many years afterwards and died of other causes. Such being the case, there is nothing extraordinary re the survival of some dinosaurs past the Cretaceous event into the following Tertiary period. Besides, as we shall indicate below, the radiation was not the greatest hazard faced by the dinosaurs at the end of the Cretaceous period.

True, as Sagan stresses, the Hiroshima bomb was exploded in the air above the city "so the fallout was insignificant."[3] But the thermonuclear bomb detonated underwater at the edge of the Bikini Atoll in the central Pacific by the U.S. military on March 1, 1954 was 1200 times more powerful than the Hiroshima bomb. Apart from sinking the unmanned surplus ships that had been anchored in the area, the blast vaporized entire islands, sending pulverized coral and millions of tons of seawater into the sky. Twenty-two other atomic and nuclear tests were to follow, with forty-three others on the nearby Enewetak Atoll. The area became so contaminated with radioactivity that the five last tests "had to be set up by technicians wearing protective suits and respirators."[4] The atoll's top soil remains highly radioactive and so, therefore, also its vegetation and fruits, a situation which precludes human re-habitation any time in the near future, [5] since radioactive constituents require as much as 100 years in order to decay.[6] But what is a mere hundred years—or even a thousand for that matter—in relation to the geological periods we are here concerned with?

Still speaking of thermonuclear bombs in the Pacific, things were entirely different in the surrounding ocean. Only heaven knows what the casualties in life in the sea amounted to. Many fish died instantly and others within a period of three weeks after the Bikini blast. But, contrary to expectation, "there was no notable effects on the reproductive cycles of the [surviving] marine organisms exposed to radiation, nor was there any evidence of mutation in the thousands of plants and animals examined."[7] In a mere fifty years, the atoll was again teeming with life,[8] "a testament to nature's ability to heal itself."[9] As Glenn Zorpette reported in 1998, "the local sea life proliferated, and the atoll now has some of the most thriving and diverse

[1] B. Bryson, *op. cit.*, p. 349.
[2] C. Sagan, *Cosmos* (N. Y., 1983), p. 321.
[3] *Ibid.*
[4] G. Zorpette, "Bikini's Nuclear Ghosts," *Scientific American Presents* (November 30, 1998), p. 24.
[5] *Ibid.*, pp. 26-27; W. S. Ellis, "Bikini—A Way of Life Lost," *National Geographic* (June 1986), pp. 814 ff.
[6] C. Sagan, *op. cit.*, p. 322.
[7] "Bikini," *Encyclopaedia Britannica*, Vol. 3 (1959 edition), p. 559.
[8] G. Zorpette, *op. cit.*, p. 25.
[9] *Ibid.*, p. 24.

populations of marine creatures on the earth."[1] In part, this was due to the fact that radioactive constituents are soluble in water, which solution has long ago been washed away by tides and currents.[2] In past mass extinction events, similar circumstances would account for the continued existence of those oceanic organisms that have so much bewildered previous theorists. Moreover, as Chatterton noted, those marine organisms that would have been thriving at great depths in the ocean would have been shielded from the radiative outpouring. If this applies to the Ordovician and gamma-ray-producing collapsing stars, it surely would apply to proto-Saturn's flare-ups in all of Earth's past mass extinctions.

The proto-Saturnian flare-ups would also have released a vast amount of heat. In fact, Saturn still radiates an abundance of "left over" heat.[3] Although the reason for this heat is sometimes explained as being due to "the gravitational collapse that formed the planet in the first place,"[4] the truth is that, given the planet's size, "scientists aren't sure why it radiates any heat at all."[5]

We have, in one of our previous volumes, seen how proto-Saturn's heat was responsible for melting the glaciers of the Pleistocene Ice Age.[6] But although it has been suggested that Earth might have been gripped within an ice age during the middle of the Cretaceous period,[7] there is ample evidence to the contrary, that Earth actually got warmer, "much warmer," when "the average temperature of the planet increased by 25 degrees."[8]

> "During that period nearly the entire globe was a lush tropical garden. Ferns grew near the North Pole; alligators basked in Alaska; dinosaurs roamed the whole planet. Fossils of these heat-seeking organisms provide the evidence for just how warm it was."[9]

What the heat from proto-Saturn's flare-ups would have done is ignite forest fires throughout the world. This would account for the layers of soot found in strata in association with the Cretaceous-Tertiary boundary. These "microscopic particles of soot—spherical particles of carbon often clustered like grapes" have "a composition that matches the smoke from forest fires."[10]

> "Globally the soot amounts to nearly 70 billion tons of residue. It is the ash of the Cretaceous world."[11]

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[1] *Ibid.*, p. 25.
[2] *Ibid.*, p. 27.
[3] J. Kluger, *op. cit.*, p. 31.
[4] *Ibid.*
[5] F. Guterl, "Saturn Spectacular," *Discover* (August 2004), p. 43.
[6] *Flare Star*, pp. 370 ff.
[7] "Putting the Cretaceous on Ice," *Discover* (December 1988), p. 6.
[8] E. Dobb, "Hot Times in the Cretaceous," *Discover* (February 1992), p. 11.
[9] *Ibid.*
[10] D. A. Kring & D. D. Durda, "The Day the World Burned," *Scientific American* (December 2003), p. 100.
[11] *Ibid.*

As noted above, some researchers found no sign of the tell-tale soot in various North American sites, leading them to doubt the global firestorm said to have been triggered by the theorized impact. But while such a firestorm would necessarily have been global in extent, there is no reason to suppose that each and every forest on Earth went up in flames. "One might ask how anything managed to survive the inferno at all," David Kring and Daniel Durda noted. But as they themselves realized: "A crucial factor was the uneven distribution of fire."[1] And: "Although soot had been found throughout the world, fires need not have erupted everywhere, because soot could have been blown to some sites by the wind."[2] In fact studies have shown that "northernmost North America and Europe escaped the worst of the devastation."[3]

> "In what is now the Northwest Territories [in Canada]...part of the forest canopy survived the wildfires even in cases where fires consumed the undergrowth...In these and other comparatively safe regions, the heat was less intense, so swamps or swamp margins afforded plants and animals protection."[4]

But:

> "In most areas, it did not really matter whether vegetation was growing in a dry place or in a humid swamp. Hot temperatures lasted so long that moisture was driven from wet vegetation, like wood in a kiln, and then set ablaze."[5]

Studies also show that wind-pollinated trees "seem to have survived better."[6] And, while many insects disappeared, [7] we have already noted that quite a few managed to survive. Moreover, as if the fire itself was not enough, it also produced severe air pollution that would have "choked the sky over the entire planet, making it impenetrable to sunlight."[8]

> "Some calculations suggest that the surface was as dark as a lightless cave, although the precise amount of darkening remains uncertain. In any event, photosynthetic plants died and food chains collapsed, even in areas untouched by wildfires, such as the sea."[9]

Although the above conclusions were the result of studies conducted in relation to the impact theory, it would have been no different under the scheme presented here. But what, then, of the impacts themselves? What relation, if any, do they bear on our proposition?

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[1] *Ibid.*, p. 104.
[2] *Ibid.*, p. 102.
[3] *Ibid.*, p. 104.
[4] *Ibid.*, p. 105.
[5] *Ibid.*, p. 103.
[6] *Ibid.*, p. 105
[7] *Ibid.*
[8] *Ibid.*, p. 103.
[9] *Ibid.*

One can actually start by suggesting that if, as per other theorists, the Solar System could have collected debris as it traveled through the Galaxy, so could have the proto-Saturnian system. But since the Solar System is presently traversing the galactic plane with no bombardment taking place, this explanation has to be discarded altogether. In this particular case, what does not work for the impact theory will not work for the proto-Saturnian one.

From where we now stand, it is difficult to tell from where and how the proto-Saturnian system could have collected its impacting debris. But what has been discovered about the present state of Saturn through space exploration is enough to show that, throughout its history, it has managed to adopt quite a family. While only nine Saturnian satellites could be seen through Earth-based telescopes, the more sophisticated instruments of the 21st century were soon to dramatically increase that number. Thus, by July 2004, the Saturnian moons had increased to 31,[1] and to 37 by November of the same year,[2] and 56 as of December 2006.[3] Moreover, most of these Saturnian orbiters are quite a hodge-podge of different, not to say odd, bodies. It is therefore highly unlikely that they all had formed in the same place (to say nothing of the same way). Some of them are nothing but heavily pitted and cracked boulders of irregular shape. Some seem icy, some seem not to be. Under the scheme presented here, it is even more difficult, if not impossible, to confirm the number of bodies, large and small, that might have constituted proto-Saturn's *original* retinue. But it is more than likely that, with each flare-up, quite a few of these asteroidal hunks would have been dispersed into space, with Earth capturing a small share of them.

This might be why certain meteorites retrieved on Earth have been found to contain what has been described as "the remains of a puzzling mix of radioactive elements" which, as usual, gave rise to a number of competing hypotheses.[4] Among these conjectures, the impact theory was conspicuous for its absence since neither asteroids nor comets are known to be radioactive. Thus, when it came to a meteorite recovered in China which contained the remnant of radioactive chlorine, it was enough to revive the theory of nearby supernovae for the umpteenth time.[5]

It is not to be assumed that whatever impacted on Earth necessarily fell during those times of mass extinction. Chances are that terrestrial impacts would have occurred at any time. Space debris falling to Earth is not necessarily subject to flare-ups. It can, however, be concluded that if debris had already been orbiting proto-Saturn, some of it would have been scattered during such flare-ups. And even then, whatever such material would have been scooped up by Earth would not necessarily have fallen all at once. Some of it could easily have gone into orbit around Earth, to fall to ground with orbital decay. All of which would then explain why the suspected impact craters are found in a spread before, within, and after extinction boundaries.

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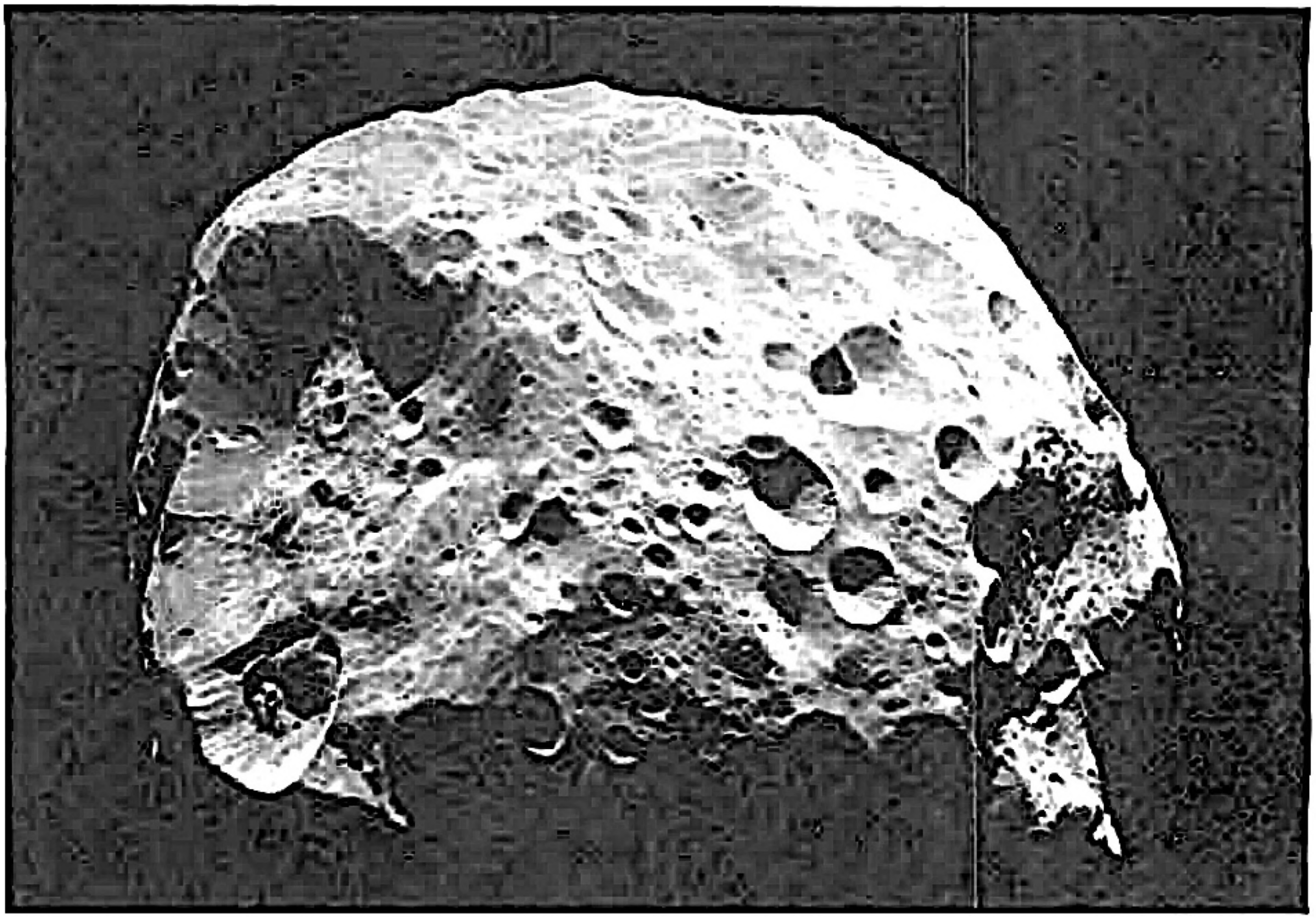
[1] J. Kluger, *op. cit.*, p. 29.

[2] R. Talcott, "Cassini Targets Titan," *Astronomy* (February 2005), p. 74.

[3] B. Douthitt, "Voyage to Saturn—Beautiful Stranger: Saturn's Mysteries Come to Light," *National Geographic* (December 2006), p. 49.

[4] H. Muir, "Earth, Wind and Fire," *New Scientist* (May 17, 2003), pp. 26-29.

[5] "Solar-System Supernova?" *Sky & Telescope* (June 2005), p. 24.



Phoebe, one of Saturn's irregular-shaped satellites.
(Photograph courtesy of NASA.)

Some impactors might not even have been solid bodies. They might, instead, have been electrical discharges in the form of colossal lightning. That lightning can actually excavate matter out of the ground, producing furrows and circular hollows, has been demonstrated often enough. Thus in 1949, at Baker, Florida, lightning struck the infield during a baseball game, killing three players and injuring another fifty people. Where it struck the ground, the bolt gouged a sinuous trench that was forty feet long.[1] Another bolt that struck a golf green's flagstaff seared the grass in a network of streamers radiating from the pole,[2] a virtual Lichtenberg figure that is uncannily similar to ray systems radiating from lunar craters. Ralph Juergens has even proposed that the lunar rilles and craters were excavated by colossal lightning in the form of interplanetary discharges.[3] This theory has since been taken up by Wallace Thornhill who has explained such colossal scouring of planetary and satellite surfaces as Electric Discharge Machining which, on a much smaller scale, is now regularly being

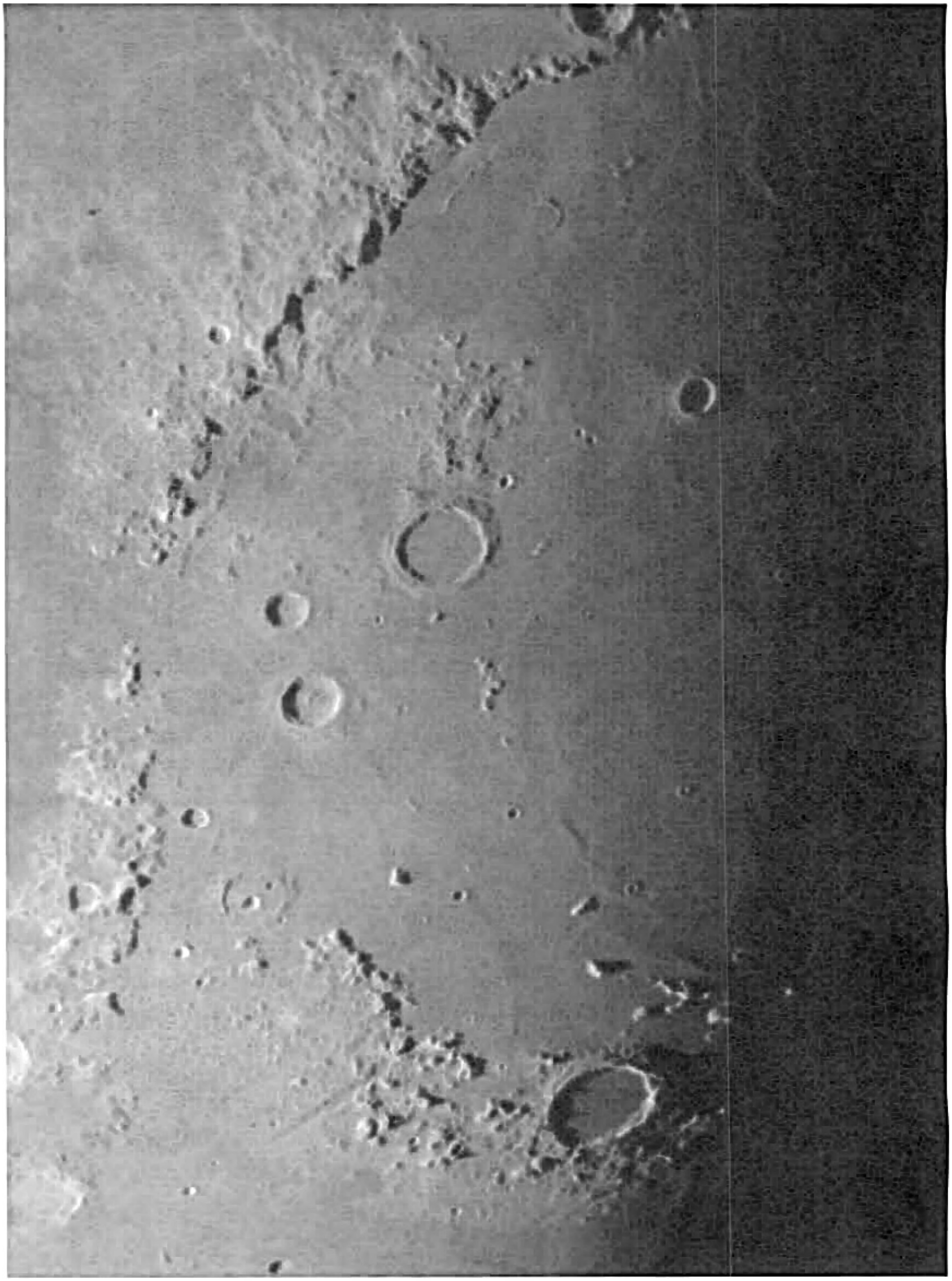
[1] F. B. Colton, "Lightning in Action," *The National Geographic Magazine* (June 1950), p. 827.
[2] *Ibid.*, p. 819.
[3] R. E. Juergens, "Of the Moon and Mars," Part 1, *Pensée* IVR IX (Fall 1974), pp. 21 ff.; *idem*, "Of the Moon and Mars," Part 2, *Pensée* IVR X (Winter 1974-75), pp. 27 ff.

Wolfe Creek Crater
(Aerial view, looking north.)

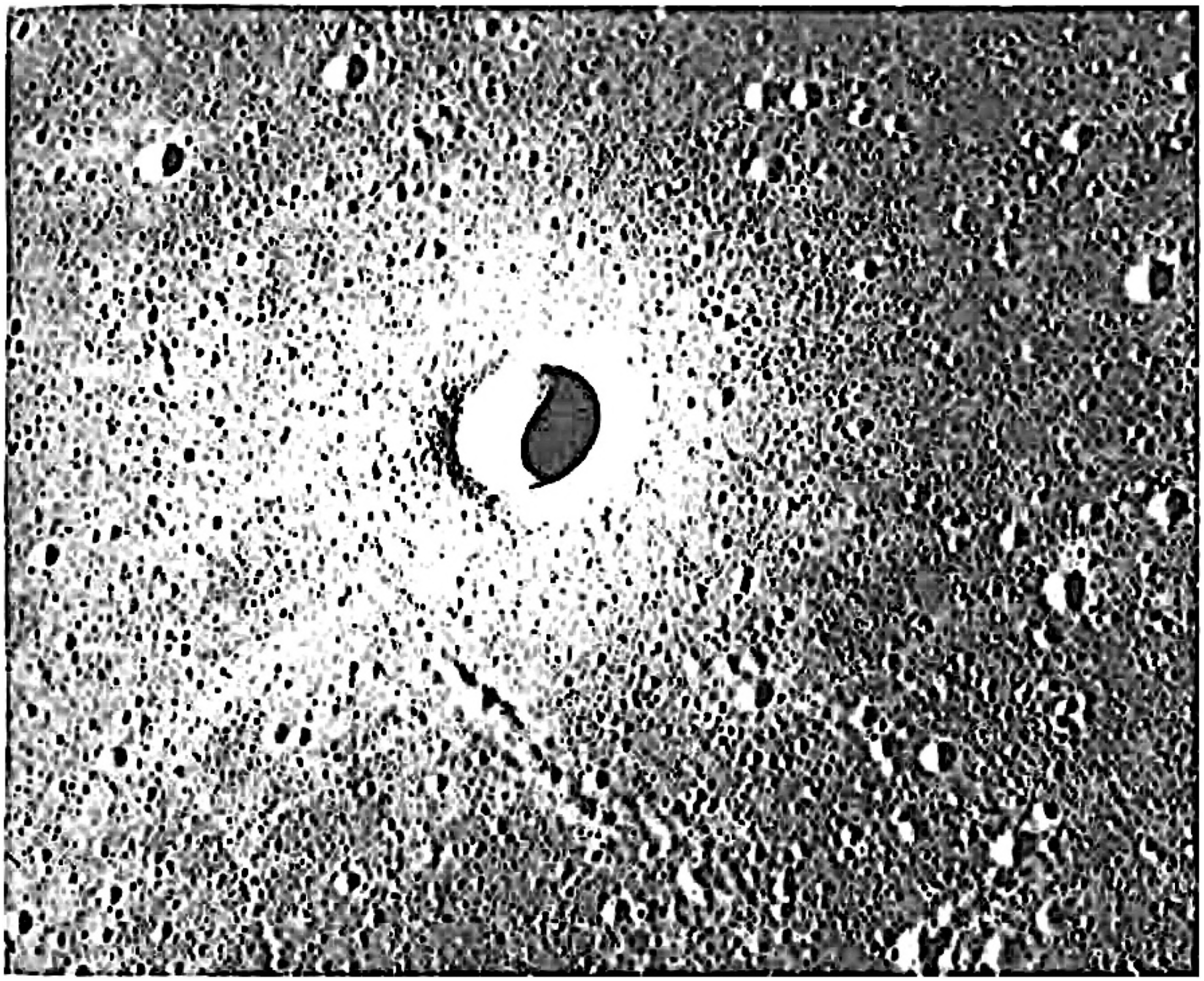
performed in laboratories and micro-engineering projects.[1] Scaling accounts for the larger sizes seen in nature. Taking his hint from Thornhill, the geologist Louis Hissink investigated Wolfe Creek Crater in Australia, which also contains radioactive elements around its rim,[2] and came to an identical conclusion, that the scar was excavated by "an enormous electrical discharge between Earth and some other cosmic body."[3] In turn this led Amy Acheson, like Juergens and Thornhill before her, to propose similar processes on the Moon especially in relation to Mare Imbrium.[4]

One factor in planetary craters that speaks against the plausibility of their having been excavated entirely by the impact of solid bodies is their overall circularity. Had such near-perfect circular craters been the result of impacting solid bodies, one would have to assume that all these bodies had landed vertically which, with bodies coming from all directions, would be

[1] See for instance, W. Thornhill, "The Electric Universe," *Chronology & Catastrophism Review* (2000:1), pp. 82 ff.
[2] L. A. G. Hissink, "Wolfe Creek Crater: Some Recent Geophysical Data," *AEON* VI:4 (August 2003), p. 15.
[3] *Ibid.*, p. 17.
[4] A. Acheson, "Thorium Enrichment in Crater Rims: Earth and Moon," *AEON* VI:5 (July 2004), pp. 138-142.



Mare Imbrium.
Were these scars the results of planetary electrical activity?
(Photograph courtesy of La Azotea Observatory, University of Guanajuato.)

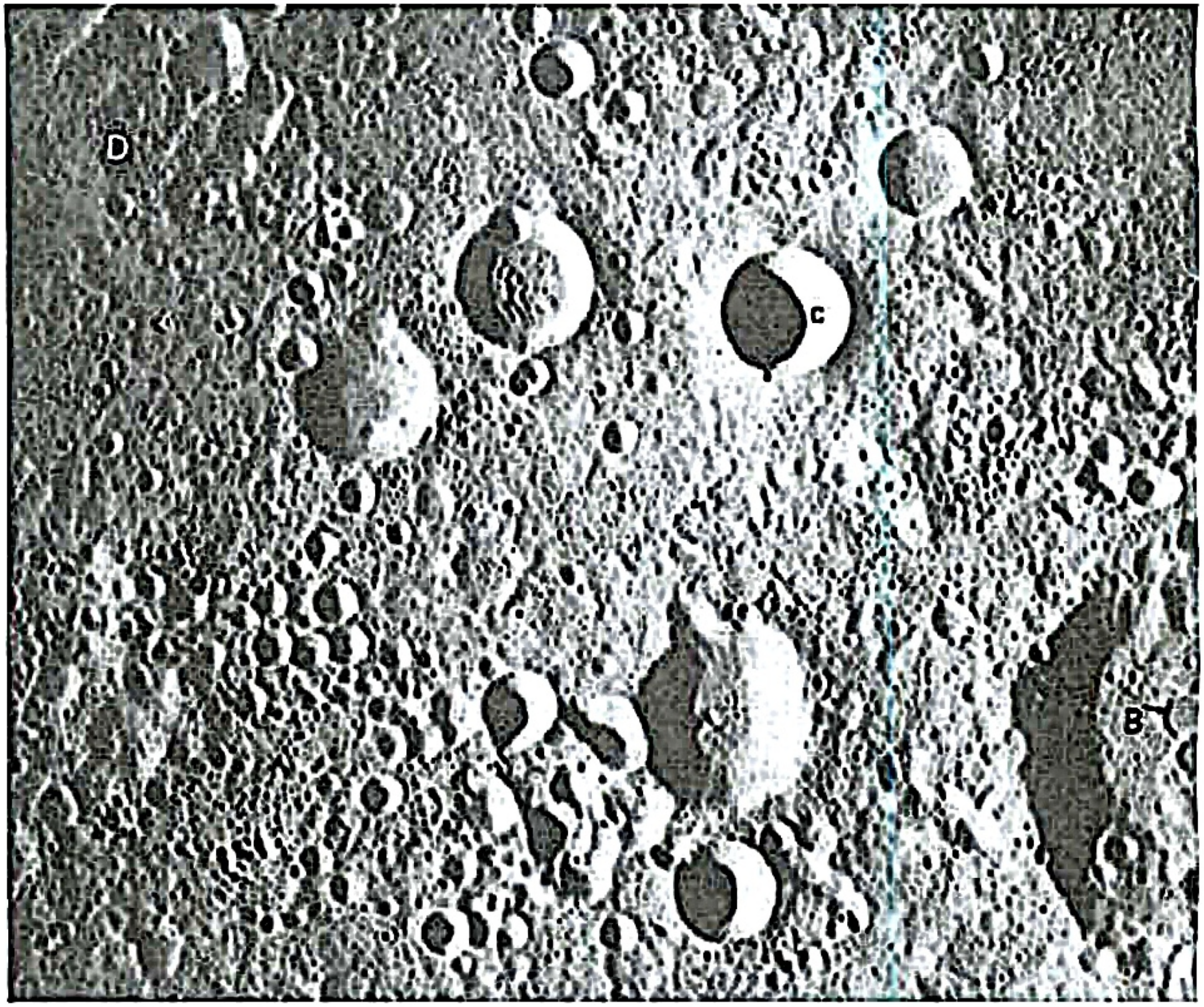


Would meteors falling obliquely have formed such perfectly circular craters as this one on the Moon? (Photograph courtesy of NASA.)

highly unlikely. What one would expect from bodies falling obliquely to planetary and satellite surfaces are elongated craters with debris piled up at one end, something that we seldom see in the untold numbers of photographs relayed to Earth from orbiting spacecraft. Thunderbolts, on the other hand, as Thornhill noted, "always hit the surface vertically."[1]

Another factor concerns the isolated peaks in the direct centres of some planetary craters. These are usually explained as due to the rebound of material from the impact of solid bodies. Yet some of these pinnacles exhibit layered strata that correspond to the stratified seams on the surrounding crater walls. These elevations are unquestionably left-over material that the impacts failed to excavate. If these pinnacled craters were formed by the impact of solid bodies, one would have to assume that the solid bodies were tightly doughnut in shape. Electric Discharge Machining, on the other hand, operates in a circular motion which often leaves the centres of the created pits untouched, thus accounting for the central pinnacles.

[1] W. Thornhill, *Electric Universe Presentation* (2005), Presentation 54.



Circular lunar craters.
(Photograph courtesy of NASA.)

As if to clinch the matter, photographic images of the nucleus of Halley's Comet taken by the spacecraft Giotto in March 1986 showed "plasma beams centered on craters facing the sun."[1]

> "What we saw [Thornhill indicated] were circular craters being formed right in front of the Giotto cameras—producing the same kind of scarring seen on asteroids and moons. It was confirmed by the discovery of X-rays and high energy ions near the nucleus that the material was being electrically removed."[2]

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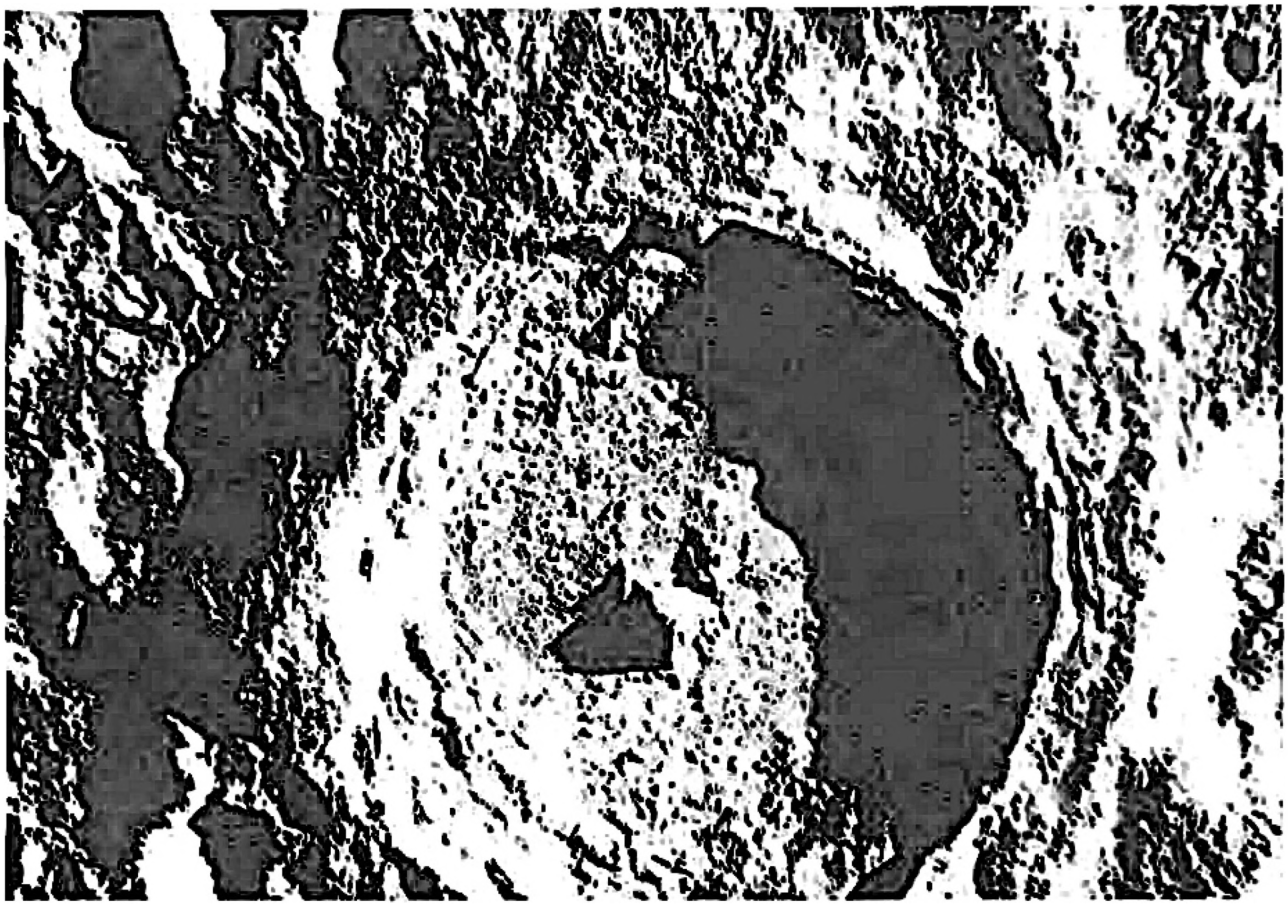
[1] A. Acheson, in a review of W. Thornhill's "The Electric Universe CD," *THOTH* III:4, electronic newsletter sponsored by KRONIA Communications (February 15, 1999), p. 2.
[2] *Ibid.*



Lunar crater Tycho exhibiting central peak.
(Orbiter photograph courtesy of NASA.)

Even some of the shocked quartz and other minerals, which have been touted as prime evidence for the occurrence of impacting solid bodies, could have been formed by electrical discharges. Take, for instance, what the geologist Robert Dietz has stated on the subject. "Barring the unlikely possibility of a natural nuclear explosion," he wrote, "a meteorite impact is thus the only mechanism for producing intense shock on a large scale..." To which he added that "a lightning bolt might do so on a small scale."[1] But *planetary* bolts would do so on a *very large* scale.

The sustained Birkeland current, or plasmatic "jet," that stretched between Earth and proto-Saturn can actually be likened to an arrested lightning stroke, except that in this case it would have been of planet-spanning proportions. That colossal electric discharges can be sustained in space was proven by Andrew Gray's discovery of "the Snake," a bright strand, 150 light years long and a couple wide, near the centre of the Milky Way. It is similar to other so-called "threads" which have been discovered within the barrel-shaped region of space known as the Galactic Centre Lobe. Gray himself described "the Snake" as "an electrical discharge, like a vast lightning bolt—so vast that it just hangs in space, instead of disappearing as

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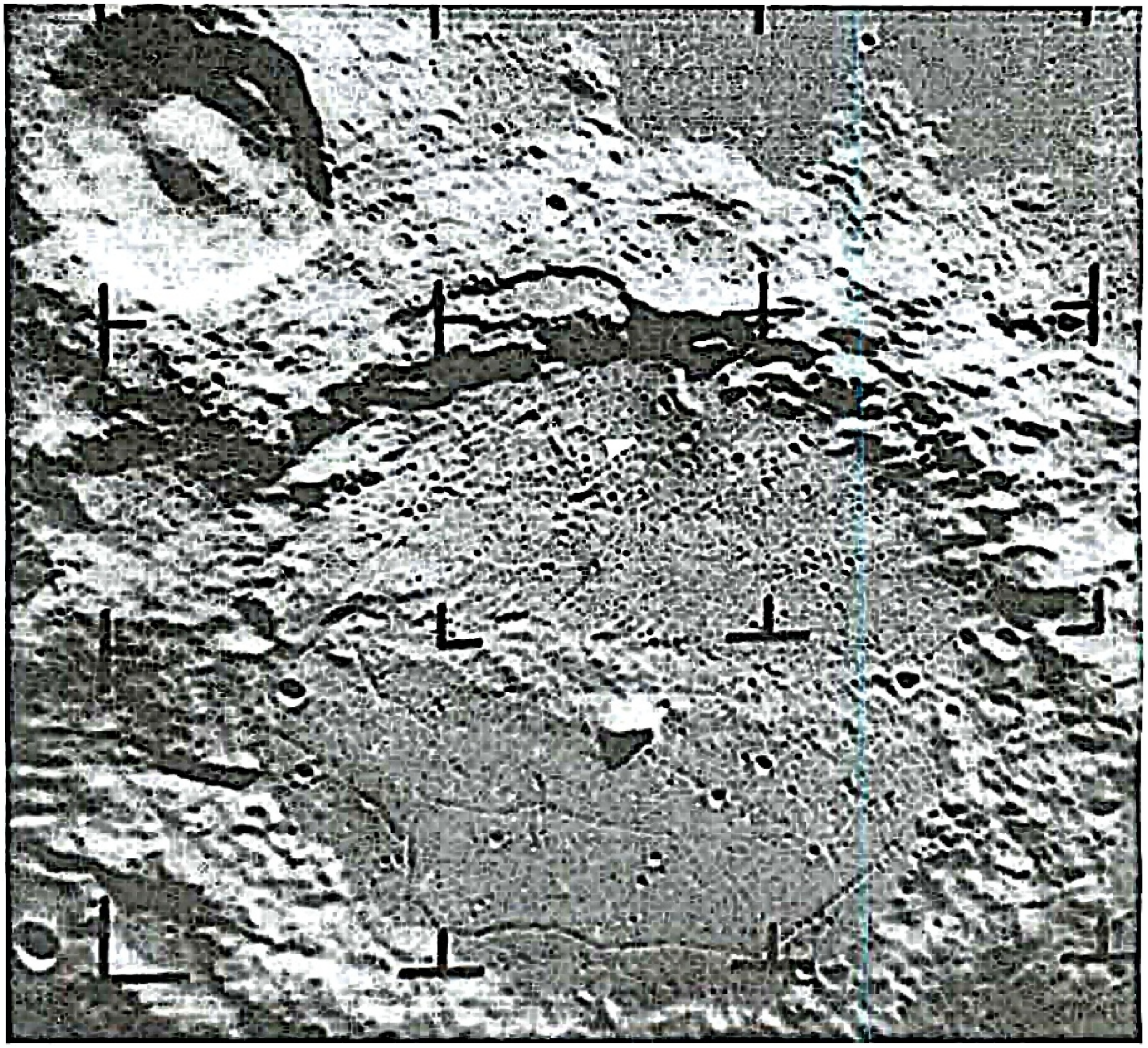
[1] W. Thornhill, *Electric Universe Presentation* (2005), Presentation 54.



Lunar crater Alphonsus and smaller companion, both exhibiting central peaks. NOTE: The peak in Alphonsus is certainly too small had it been created by the rebound from the impact which would have created such a large crater. (Ranger IX photography courtesy of NASA.)

earthly lightning does."[1] With a similar sustained discharge between Earth and Proto-Saturn, there already was a direct electrical connection between the two. Earth would also have been conditioned to whatever electrical potential proto-Saturn itself was subject to. Thus if proto-Saturn's recurring flare-ups were due to a change in its electrical environment, or a change in its intrinsic electrical make-up, it should be expected that subsidiary discharges would have both preceded and followed the main flare. And while the flare itself would have been sudden, these auxiliary discharges could have gone on for quite some time before and after the main outburst.

[1] "Here Be Serpents," *The Economist* (March 8, 1997), p. 120.

Impacts, electrical and otherwise, were not the sole cause of extinctions, as neither were the major flares themselves and the radiation they let loose. As Velikovsky pointed out, there is still one important phenomenon which the supernova theory does not explain, and that is "the geological upheavals that accompanied the great extinctions."[1] But while supernovae do not explain the geological upheavals in question, the proto-Saturnian flare-ups surely do.

Stellar flares in the relative vicinity of other astral bodies tend to change the rotational period of those bodies. A change in spatial electrical environment might also induce rotational change. Whether rotation is speeded up or slowed down would depend on whether the astral bodies receive an extra electrical impetus or pass into an environment of lesser electrical potential.[2] As we deduced in relation to the end of the Pleistocene, Earth would have reduced its rotational speed during proto-Saturn's flare-up.[3] Earth would therefore also have braked or speeded up during the previous flare-ups we are here considering. And, as deduced in relation to the end of the Pleistocene, such changes in rotational speed would have caused geological havoc.

Thus those who saw changes in sea levels as the cause for the dinosaurs' extinction were not entirely wrong. In 1958, Rhodes Fairbridge brought together the different hypotheses that had by then been offered to explain sea level changes. The main theories at the time were continental flexure, eustatic oscillations, a change in the terrestrial axis, and changes in Earth's rotational speed. His conclusion was that "there may be some truth in all these hypotheses," but, according to him, "each has limitations that prevent it from explaining all the facts." But his advice that we need "to keep all factors in mind and develop an integrated theory," seems to have fallen on deaf ears.[4] Keeping all factors in mind while developing an integrated theory is what this work is all about.

In the main there was more to oceanic activity than just a change in sea levels. One of the first devastations caused by Earth's braking would have been the irruption of the world's oceans which would have continued circumnavigating at their original speed due to inertia before eventually slowing down. This would have been equivalent to a colossal multiple tsunami of global proportions which would have caused them to sweep over the land, carrying whatever lay in their immediate path to destruction. We saw this transpiring at the end of the Pleistocene[5] and, in fact, all the other cataclysms that resulted from Earth's change of rotational speed during that period had occurred throughout all earlier geologic breaks and extinction events but on a much more destructive scale. It should be noted that some of these past changes would have involved a speeding up of Earth's rotation, in which case the oceans would have temporarily lagged behind. But this would still have entailed an oceanic incursion that would have occurred in reverse while the opposite shores caught up with Earth's lagging seas.

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[1] I. Velikovsky, "On Saturn and the Flood," *KRONOS* V:1 (Fall 1979), p. 9.

[2] See here, R. E. Juergens, "On the Convection of Electric Charge by the Rotating Earth," *KRONOS* II:3 (February 1977), pp. 13-14.

[3] *Flare Star*, pp. 372 ff.

[4] See R. W. Fairbridge, in L. H. Ahrens (ed.), *Physics and Chemistry of the Earth* (Pergamon, 1961), pp. 99-185.

[5] *Flare Star*, pp. 391 ff.

Those who had blamed extinction events, including that of the dinosaurs, on plate tectonics were also right, but not for the reasons they presumed. Although the supercontinent of Pangaea had a long history behind it, its break-up would have probably speeded up during the Cretaceous-Tertiary event. Richard Fortey does not quite say so, but he does admit that the process of breaking up "was well underway in the Cretaceous."[1] Brian Hills tells us that the break-up took place in the early stages of the following Tertiary period, "creating the Atlantic Ocean with North America drifting away from Europe and South America drifting away from Africa."[2] The exact sequence and timing of these tectonic shifts, however, have not yet been carved in stone, so that we can only accept the foregoing as a scholarly approximation. Writing in 2003, Hills could still warn that "given the historic nature of these processes and their geological timescale, many of the details remain to be researched and are a source of debate."[3]

Much earlier, in studying the distortion patterns of Earth's girdling rift and associated ridges, Melvin Cook came to the conclusion that the rifting occurred "within a few hours, or days at the most."[4] And, still according to him, the total duration of the rifting plates "may have been as little as six or seven hours,"[5] with "about 6 to 8 hours" for the rift "to encircle the Earth."[6] Granted that Cook's model was based on "the ice cap model of continental shift," it also included the suggestion of "possible contributions by heavenly bodies."[7] The heavenly bodies that Cook had in mind were meteoric impacts that "may have contributed to the process of the split up of Pangaea under ice cap pressure."[8] It therefore remains somewhat uncertain whether the short duration claimed by him for the break-up of the supercontinent remains valid in relation to our scheme. Keep in mind, however, that matter from mid-ocean rifts, which is the driving force behind continental drift, constantly rises from below even during terrestrial stability. That the motion of continental plates can increase, even under more-or-less uniformitarian processes, has been shown by Michael Gurnis, who uses this process to account for rising sea levels.[9] Think of how much the spreading magma would have speeded up in response to the tectonic forces under consideration. Mere hours, as per Cook, might or might not be somewhat extreme. On this issue, if on no other, I must straddle the fence. But on a geologic time-scale, the accelerated spreading would still have been relatively fast.

It also follows that those who set their sights on global volcanism as the cause of extinction, whether that of the Cretaceous or earlier periods, were also correct. As earlier stated,

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[1] R. Fortey, *op. cit.*, p. 267.

[2] B. Hills, *Origins: Cosmology, Evolution & Creation* (Cambridge, 2003), pp. 138-139.

[3] *Ibid.*

[4] M. A. Cook, "Earth Tectonics Viewed from Rock Mechanics," *Chronology & Catastrophism Review* XIII (1991), p. 11.

[5] *Ibid.*, p. 15.

[6] *Ibid.*, p. 18.

[7] *Idem*, "Ice Caps, Continental Shift and the Break Up of Pangaea," *Chronology & Catastrophism Review* (1997: 1), p. 30.

[8] *Ibid.*

[9] J. D. Archibald, *op. cit.*, p. 150.

however, global volcanism requires a cause of its own, and the change in Earth's rotation more than supplies it. Whether the fall of iridium at the Cretaceous-Tertiary boundary, and other geological demarcations, came from these global volcanic eruptions, or whether it owes its origin directly to proto-Saturn's flare-ups, I will leave for posterity to decide. We should not, however, lose track of the fact that iridium is also one of the signatures of an exploding star.[1] Earthquakes, landslides, wrinkling of Earth's surface, the leveling of other areas—all these upheavals, and more, would have followed in each other's wake. A proper analysis of these successive cataclysms would fill volumes and this is not the place to delve into the matter in any detail. But those who could not believe in a single cause for the extinction of life, those who believed in multiple causes, were perhaps the most correct. It is the totality of all the ensuing catastrophes mentioned above that served not only to wipe out most of Earth's past life, but even to repopulate it with new forms after each event.

When it comes to the dinosaurs' extinction, however, their size had to have been the most devastating hazard they were forced to face. As I write this, academia continues to show its bewilderment at the immense size these beasts achieved, especially since newer ones were continuously coming to light. Thus, for instance, one discovered in Mongolia in 2002, now named *Erketu ellisoni*, had a neck calculated to have been 7.5 meters—that is 24 feet—long.[2] Although not the largest, or even longest, sauropod, this would have given *Erketu* the longest neck—far longer than the rest of it, including its tail—relative to the rest of its body among all known dinosaurs thus far discovered. In order to explain how such a beast could have held its head up, air cavities in its vertebrae, as well as parallel bony ridges running along its spine, had to be called upon despite their lack of evidence.[3]

Palaeontologists had also come to the conclusion that dinosaurs had even grown *faster* than all living reptiles. This was deduced from the growth lines in dinosaur bones, which act somewhat like tree rings. But all that could be ascertained was that their fast growth implies that they had a high metabolic rate which was closer to that of warm-blooded animals and birds than to cold-blooded reptiles. [4] In other words, it merely reinforced what had already been known. The study did nothing in elucidating why, and how, dinosaurs grew to their colossal size. "One of the most cherished features of dinosaurs—their gigantism—is also one of the most mysterious," wrote Joel Achenbach, who then asked the question: "Why in the world were these animals so huge?"[5]

One suggestion was that some of the dinosaurs "may have evolved to a larger stature as a way of escaping predators or gaining a competitive advantage."[6] But why, then, did smaller dinosaurs, some no bigger than a chicken, retain their smallish size? If any dinosaur needed stature as a way of escaping predators, surely these diminutive members should have filled the

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[1] N. Calder, *op. cit.*, pp. 134, 136.

[2] "Long-necked Erketu," *Macleans* (April 3, 2006), p. 12.

[3] "Heads Up," *Smithsonian* (June 2006), p. 18.

[4] J. R. Horner, *et al.*, "How Dinosaurs Grew so Large—and so Small," *Scientific American* (July 2005), pp. 56 ff.

[5] J. Achenbach, "Dino-size," *National Geographic* (July 2005), p. 1.

[6] *Ibid.*

bill. Sara Decherd then offered that gigantism among dinosaurs may have risen to bestow large stomachs which would have been needed to digest the fibrous low-nutrient plants on which, one has to assume, they were forced to subsist.[1] But this should have affected all dinosaurs, large and small. She then blamed the much more nutritious flowering plants that became available during that age for the creatures' decline in size.[2] One would have thought that higher nutrients would have made for bigger size. Actually, Matt Carrano gave what may perhaps be the best solution in that dinosaurs "evolved toward gigantism simply because they could."[3] And, in our opinion, they *could* because gravity was at that time attenuated. With the changed electrical potential that led to proto-Saturn's flare-up, terrestrial gravity increased and the dinosaurs simply could no longer cope.

Under this scheme, except for those who might have been at various grounds-zero, dinosaurs would not have died instantly. The change in gravity, even if *it* was instantaneous, would not have killed them straight away. The old and weak might have succumbed, but young and strong would have probably survived even if their life was more than probably shortened. Those newly-born, however, would have had a harder time coping with the change and, as time went by, less and less of them could thrive under the greater gravitational burden they were forced to bear—which is why quite a few of them passed over the boundary from what we term the Cretaceous into the Tertiary period. In the end, however, as we noted on an earlier page, no land vertebrate that was over 25 kg in weight is actually known to have survived the final winnowing.[4]

> "In concluding that bigger may not be better after all [Achenbach was shrewd in pointing out], keep in mind that only one line of rather small dinosaurs survived the end-of-Cretaceous mass extinction. They're called birds."[5]

Yes, it has to be admitted that this was a slight exaggeration since, as we have seen, some dinosaurs did make it past the Cretaceous extinction. But here's the catch—as Eric Buffetaut pointed out, "crocodiles that occupied shallow marine waters survived the extinction but the mosasaurs did not."[6] As it has been shown, "no land animal weighing more than about 25 kilograms (55 pounds) survived" even though "many of those that disappeared were considerably smaller."[7]

From the very inception of life on Earth, organisms grew bigger with each succeeding break in the geological record. Each of these breaks, in our opinion, was engendered by a proto-Saturnian flare. Each flare was in its turn brought about through proto-Saturn's intrinsic

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[1] *Ibid.*

[2] *Ibid.*

[3] *Ibid.*

[4] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 106; see also P. J. James, *et al.*, "Global Catastrophes: New Evidence from Astronomy, Biolohy and Archaeology," *S.I.S. Review* VI:4 (1981/82), p. 91.

[5] J. Achenbach, *loc. cit.*

[6] D. A. Russell, "The Mass Extinctions of the Late Mesozoic," *Scientific American* (January 1982), p. 65.

[7] *Ibid.*; *idem*, "The Enigma of the Extinction of the Dinosaurs," *Annual Review of Earth and Planetary Sciences* 7 (1979), pp. 163-282.

change in electrical potential. Time and again, Earth's gravitational attraction was reduced. The limit was reached during the Cretaceous period. At no other time did life attain such gigantism. The next proto-Saturnian flare had the opposite effect in increasing, rather than decreasing, Earth's gravity. From then on, life forms began a decline in size.

THE POLAR DINOSAURS

The belief that a nuclear winter followed the theorized impact of the asteroid that supposedly finished off the dinosaurs received its greatest setback with the discovery of dinosaur remains on Alaska's North Slope within the Arctic Circle.[1] As it has been argued, if dinosaurs could have thrived within the Arctic, living through at least two annual sunless months, they could not have easily succumbed to the darkness and cold that would have followed an impact. At first sight, this objection can just as easily be brought to bear against the proto-Saturnian theory. Despite the fact that Earth's natural illumination would already have been much dimmer,[2] and despite the fact, as noted earlier, that the "precise amount of darkening remains uncertain," a fair amount of murkiness would probably still have settled upon Earth from the smoke emitted by forest fires and volcanic outpourings. William Clemens, one of the discoverers of these Arctic dinosaurs, on the other hand, came up with a different solution. His reasoning was that the Alaskan members survived the extinction event *because* they had long become adapted to the cold and long dark winters of the region.[3] But even he could not help mentioning that the "nearby Arctic Ocean, *warm in those tropical days*, would have sufficiently moderated the climate."[4] He stopped short from saying—or at least asking—why the Arctic Ocean would have been warm in the first place.

An additional anomaly concerning these Arctic dinosaurs is that their bones were not fossilized—in other words, their remains were not mineralized. They were described as being "almost like modern bone."[5]

Dinosaur remains were also found by Canadian researchers, even deeper within the Arctic Circle, on Bylot Island, off the north coast of Baffin Island.[6] Again it was estimated that, at the time, "Bylot Island had a climate like northern California."[7] Dale Russell attempted to wriggle out of this dilemma by glibly asserting that "the Bylot Island find suggests dinosaurs were able to survive a normal Arctic winter, which would include two or three months of total darkness."[8] He was forced to this conclusion because magnetic measurements revealed that the paleolatitude in which the bones were discovered had been "about the same (70 degrees

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[1] B. Rensberger, "A Fiery Extinction," *Science Digest* (January 1986), p. 22.

[2] *God Star*, pp. 274 ff.; *Flare Star*, pp. 150 ff.

[3] *Ibid.*

[4] *Ibid.* (emphasis added).

[5] *New Scientist* (August 22, 1985), p. 18.

[6] I. C. Johnson, "Antarctic Anomalies," *AEON* II:1 (June 1989), p. 127.

[7] *Ibid.*

[8] *Ibid.*

NL) as today's latitude."[1] But not everyone was satisfied and other palaeontologists could not help declaring that "the dinosaurs thrived owing to a semitropical or temperate ecosystem, made possible because the Earth's climate then was more equable or uniform."[2] But, as Ian Johnson asked: "Why did latitude matter so little in the Age of Reptiles (and beyond)?"[3]

By the end of 1992, polar dinosaurs had been discovered at 15 different sites.[4] But, despite what had been claimed concerning the warmth of the Arctic at the time, the problem of polar winters continued to bother palaeontologists:

> "Even though the Cretaceous was much warmer than today, the polar regions would still have been chilly for dinosaurs in winter. And while nonstop daylight in summer would have encouraged lush plant growth, the long winter's night would have forced plant-eaters, especially if they tended toward cold-bloodedness, to hibernate or migrate. *Either behavior would be surprising*."[5]

By the turn of the century, what was considered as "possibly" being "the densest concentration of saurian fossils in the world" had come to light within the Arctic Circle.[6] Palaeontologists had known about this dinosaur bone area, named the Kikak-Tegoseak bed, "but not its remarkable density."[7] The dinosaur bones in this bed, it has been stated, are "nearly as ubiquitous...as the Arctic's summer sun" which during that season never sets.[8]

> "Previously Alaska's horned dinosaurs have been discovered one at a time. 'Finding that many skulls [of] ceratopsians stacked one on top of another is a pretty much unusual situation,' says Roland Gangloff, expedition organizer and curator of earth sciences at the University of Alaska Museum..."[9]

> "'It's probably a huge bone bed,' [Anthony] Fiorillo says, 'and we're looking at a little, tiny part of it.' Gangloff goes further, adding that the entire...region 'will someday be recognized worldwide as one of the greatest dinosaur fossil accumulations in the world."[10]

According to Fiorillo, these dinosaurs "probably died together in a flood or other catastrophe."[11] Which, at this point, is not a surprising disclosure. That they did not die a normal

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[1] *Idem*, "Anomalous Occurrence of Crocodilia in Eocene Polar Forests," *Chronology and Catastrophism Review* XIV (1992), p. 9.

[2] *Ibid.*, pp. 8-9.

[3] *Ibid.*, p. 9.

[4] R. Gore, "Dinosaurs," *National Geographic* (January 1993), p. 38.

[5] *Ibid.*, pp. 36, 38 (emphasis added); see also M. Leslie, "The Strange Lives of Polar Dinosaurs," *Smithsonian* (December 2007), p. 73.

[6] S. Senkowsky, "Cretaceous Park," *Scientific American* (December 2002), p. 26.

[7] *Ibid.*, p. 28.

[8] *Ibid.*, p. 26.

[9] *Ibid.*, p. 28 (ellipses as given).

[10] *Ibid.*

[11] A. R. Fiorillo, "The Dinosaurs of Arctic Alaska," *Scientific American* (December 2004), pp. 85, 86.

death is indicated by the fact that, as of 2004, a single complete skeleton had yet to be discovered anywhere in Alaska.[1]

Hadrosaurs, which are plant-eating dinosaurs, "could stand on their back legs to reach overhead foliage."[2] With so many of the creatures congregated around the area of their discovery, this would entail that such foliage had to have proliferated.

"How did dinosaurs find themselves at the planet's northern extreme?" asked Fiorillo. His own answer was that more than likely they had trudged across from Asia because ancestral forms of almost all the Cretaceous dinosaur families found in North America existed there.[3] Yet even he had to admit that one species, at least, "apparently arrived by a southerly migration path" since "remains of its ancestors are found on the continents of South America and Africa."[4] And then he adds that: "Some of the immigrants probably just stayed in the far north because the environment there supplied their needs..."[5] But how could the Arctic environment have supplied their needs if, as it was still believed, it was then as cold and hostile as it is now? To be fair, Fiorillo himself does acknowledge this conundrum:

> "Alaska is built of enormous geologic blocks [he writes], some of which originated far from their present location. *During the Cretaceous, however, many of these blocks of land were near their current latitudinal position or higher*. Thus, the dinosaur fossils found in Alaska were not posthumously hijacked from distant climes and brought there on moving plates: *they lived in the high latitudes during the Cretaceous*. Did they stay there all year? And if so, how did they manage it?"[6]

As he himself concedes, "the world was warmer then, *but the climate in the high latitude lands was still challenging, with cold, snowy winters and several months of darkness*."[7]

> "In actuality, north of the Arctic Circle, darkness occupies a longer and longer part of each day until the winter solstice (December 22), when the sun does not rise. During the Cretaceous, northern Alaska was even farther north than it is today, and so the dinosaurs that lived there would have needed mechanisms to cope with both the cold and the dark."[8]

Various explanations were attempted to circumvent the problem—such as hibernation[9] or migration out of the area and back again when sunlight returned[10]—but no viable evidence

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[1] *Ibid.*, p. 86.
[2] *Ibid.*
[3] *Ibid.*
[4] *Ibid.*
[5] *Ibid.*
[6] *Ibid.* (emphasis added).
[7] *Ibid.* (emphasis added).
[8] *Ibid.*, p. 88.
[9] *Ibid.*, pp. 88, 90.
[10] *Ibid.*, p. 90.

could be mustered for these suggestions. "But if they stayed year-round," Fiorillo asked, "what did they eat during the cold winter months?"[1] Predators, of course, would have continued to hunt and gorge themselves on their prey. But herbivores would have had a hard time since, under uniformitarian conditions, there would not have been enough to sustain their enormous herds. Besides which, how did the vegetation needed for their sustenance survive the cold and dark winter months?

Dinosaurs were also discovered in southern Australia which, at the time, is believed to have been snuggled right against Antarctica. Like their north polar cousins, these dinosaurs were also believed to have endured prolonged darkness up to six months each winter. This then led to the conviction that these dinosaurs actually "braved the cold" and "maybe scrunched through snow and slid on ice."[2] And yet it had to be admitted that this "challenges what scientists know" about the survival of these animals.[3] Tom Rich, who is probably the greatest authority on Australian dinosaurs, has not only met the challenge, he believes to have come up with the correct solution.

> "The dinosaurs here could have been running in the dark, snowy world [Rich stated]. They weren't hibernating. I think they were active when it was really cold. These dinosaurs were probably warm-blooded animals."[4]

What led Rich to suggest that "dinosaurs could have been running around in the dark" was not only their polar locality, but also the skull of a chicken-sized ornithischian which contained "cavities for very large optic lobes." These large optic lobes "suggest" that the ornithischian in question "had enhanced night vision for polar living."[5] Might we, perhaps, "suggest" that this enhancement in such a diminutive member of the dinosaurian family had evolved in order to allow the creature better sight in the dimmer light radiated by the proto-Saturnian sun?

Never mind southern Australia, dinosaurs were also eventually discovered on Seymour Island just off the Antarctic Peninsula, details of which were revealed at the International Symposium of Antarctic Earth Sciences held in New Zealand in July 1999.[6] Remains of the mesosaurs and plesiosaurs discovered there are known to be sub-tropical creatures. So that no matter what can be said concerning the ability of dinosaurs to have thrived in cold dark regions, these particular denizens would definitely have been "out of their natural element."[7]

And again, never mind Seymour Island, dinosaur remains have also been found on the Antarctic continent itself. Just as telling is the fact that "fossilized leaves and other plant

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[1] *Ibid.*

[2] M. Leslie, *op. cit.*, p. 70.

[3] *Ibid.*

[4] R. Gore, *op. cit.*, p. 38

[5] *Ibid.*; see also M. Leslie, *op. cit.*, p. 73

[6] *Kim Hill's Programme*, Radio New Zealand, July 9, 1999, as quoted in *Chronology & Catastrophism Review* (1999:2), p. 39.

[7] *Ibid.*

remains suggest that during the dinosaurs' day Antarctica had a temperate climate."[1] How, then, according to Rich, could these dinosaurs have been "running in the dark, snowy world" being "active when it was really cold"?

The particular ornithischian mentioned above was not the only dinosaurian relative whose sight was adapted to a nocturnal habitat.[2] As pointed out in our earlier work,[3] the eyes of archosaur rhodopsins were not only suited to night vision, but better still to redder wavelengths,[4] which would have served them well in the dim red light radiated by the sub-brown dwarf star that was proto-Saturn. And mammals, too, right after the exiting dinosaurs, were probably "nocturnal" creatures as surmised by David Archibald.[5]

But back to the Arctic:

The dinosaurian *Troodon* has also been noted for its "exceptionally large eyes." As Fiorillo rightly noted: "Among modern animals, proportionately large eyes tend to be an adaptation for living in low light conditions."[6] As he goes on:

> "*Troodon* may have been preadapted to the physical constraints of the high-latitude environment, which gave it a competitive advantage and set it on the path to become the most abundant predator of the northern ecosystem."[7]

This raises a quandary of its own. As Fiorillo himself recognized, if *Troodon* "was well adapted to the low light of Arctic winters, one might wonder how it could function during the long periods of daylight in warmer months."[8] Under the proto-Saturnian sun, however, this would not have been a problem since, under its perpetual dimmer radiation, there would have been no seasonal change of light.

That dinosaurs faired well within the Arctic circle is additionally evidenced by the fact that *Troodon* is not only considered to have been rare in more southerly latitudes, it achieved "nearly twice the size of *Troodon* in more southern locations."[9] But before this is used as evidence that polar dinosaurs were well adapted to cold climates, keep in mind that, *Troodon* aside, the same type of dinosaurs that thrived in Alaska also lived "in toastier environments farther south, such as Montana and even Texas."[10] To stress what Ian Johnson had earlier noted, latitude did not matter when it came to dinosaurian habitation.

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[1] M. Leslie, *op. cit.*, p. 72.

[2] D. Eatherley, "Ancient Eye Resurrected," *New Scientist* (September 28, 2002), p. 19.

[3] *Flare Star*, p. 158.

[4] K. A. Svitil, "The Nocturnal Reptiles of Triassic Park," *Discover* (January 2003, Special Issue), p. 13.

[5] J. D. Archibald, *op. cit.*, pp. 27, 94.

[6] A. R. Fiorillo, *op. cit.*, p. 91.

[7] *Ibid.*

[8] *Ibid.*

[9] *Ibid.*

[10] M. Leslie, *op. cit.*, pp. 72-73.

To the reader of this work, none of the above disclosures should cause similar bewilderment. The biggest problem faced by palaeontologists in this respect is that even while accepting that Earth had been warmer during the Cretaceous, they cannot account for a warmer Arctic region, especially one that was even warmer than more southerly latitudes. As long as they continue to believe that, during this time, Earth was already orbiting the Sun along its present path and at its present distance, they remain faced with the same slanting solar rays impinging on the Arctic. And, as at present, these slanting rays would not have been enough to warm those regions. Not only that, but, as with the present situation, they remain faced with months of total darkness during which no direct heat can manage to reach the land.

With a different although dimmer sun suspended permanently, but much closer, in Earth's north celestial pole, all these problems disappear. Despite the age of semi-darkness which we discussed in our previous works,[1] the Arctic regions would have received perpetual light, no matter how dim, and sufficient heat with no intervening months of total gloom. Dinosaurs would then have proliferated without the need to hibernate or migrate to other regions since there would have been no onset of cold weather. And while Earth received a major portion of its heat and light through reflection off its encasing plasmasphere, the Arctic would have received a fair amount of additional heat and light *directly* from the sub-stellar sun positioned precisely above that region.

This fares well with floral species which appeared first at higher latitudes during the Cretaceous. According to one authority, Lena Golovneva, this was because these species "preferred cooler conditions."[2] And in relying on her erroneous explication, David Archibald then tells us that these same species "had earlier first appeared at higher latitudes during the latest Cretaceous, spreading southward into middle latitudes as the climate presumably cooled."[3] And, on the same page, he repeats the same dictum: "This shift toward a cooler adapted flora is recorded first at higher latitudes in the latest Cretaceous, only later does this cool-adapted flora make its way into lower latitudes."[4] But, as we saw in one of our previous volumes, there were various tropical and sub-tropical plants, as well as animals, that had appeared much earlier in Arctic regions than they did in more southerly latitudes.[5] These species could not have been "cool-adapted." On the contrary, they arose first in higher latitudes because it had been much warmer there than in more southerly ones.

Under our scheme, Earth's northern regions would have received the brunt of proto-Saturn's radiative flare-up. Life in those zones should have therefore suffered more. Signs of extinction should be more abundant than anywhere else on the planet. In fact, as Gould noted, plant species in Alaska, Northern Canada, and Siberia "suffered heavy losses" while those in

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[1] *God Star*, pp. 274 ff.; *Flare Star*, pp. 150-153.

[2] J. D. Archibald, *op. cit.*, p. 197.

[3] *Ibid.*

[4] *Ibid.*

[5] *God Star*, pp. 351-390.

the tropics "were scarcely affected by the Cretaceous extinction."[1] Although, very much as in our case, it was utilized for their own particular scenario, this was repeated by Victor Clube and Bill Napier: "Tropical plant life was relatively unaffected by the event, but most species in Alaska, Canada and Siberia disappeared."[2] And so, likewise, Dale Russell who wrote that "the terrestrial plants of the northern regions of the Temperate Zone suffered more losses than those farther south."[3] As reported in *Nature*:

> "The terrestrial flora shows major turnover at the same time as the marine disruptions, with the extinction of many forms, and the succeeding Tertiary Period saw the emergence of a new wave of evolutionary types whose descendants are with us today. The southern hemisphere was relatively spared: the areas of greatest disruption being western North America and eastern Siberia."[4]

But we're talking about mere plants. What about the dinosaurs? It is here that we encounter what might at first seem evidence to the contrary. Thus, citing various other sources,[5] Trevor Palmer tells us that "organisms living close to the equator" were the hardest hit.[6] More than that, Archibald tells us that "there is no *single* horizon in higher latitudes in which one finds major extinctions."[7] And: "The apparently more specialized species (those with less tolerance of environmental fluctuations) disappear at the K/T boundary at lower latitudes, but the fossil record from higher latitudes clearly shows that this is not a global event."[8]

Archibald, of course, was well aware that faunal fossils had been discovered in high latitude regions. He himself pointed to the fossil sequence on Seymour Island, at the north end of the Antarctic Peninsula. What has been found there, he informs us, "tells a totally different story for the end of the Cretaceous than the catastrophic extinctions that some argue occurred at lower latitudes."[9] Relying on the authority of Gerta Keller and Bill Zinsmeister,[10] he additionally tells us that:

> "Although there are changes across the K/T boundary in the marine invertebrate faunas and the palynomorphs preserved at Seymour Island, the changes do not appear to

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[1] S. J. Gould, "Of Dinosaurs and Asteroids," *1982 Yearbook of Science and the Future* (Chicago, 1981), p. 132.

[2] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 106.

[3] D. A. Russell, *loc. cit.*

[4] Paraphrased from *Nature* (November 13, 1986), p. 112, by C. Whelton, *et al* "Cretaceous Catastrophe—1," *Chronology & Catastrophism Workshop* (1987:1), p. 24.

[5] J. B. Pollack, *et al.*, "Environmental Effects of an Impact-Generated Dust-Cloud," *Science* 219 (1983), pp. 287-289; K. J. Hsü, "Terrestrial Catastrophe Caused by Cometary Impact at the End of the Cretaceous," *Nature* 285 (1980), pp. 201-203; L. W. Alvarez, *et al.*, "Extraterrestrial Cause for the Cretaceous-Tertiary Extinction," *Science* 208 (1980), pp. 1095-1108.

[6] T. Palmer, "Catastrophism and Evolution," *S. I. S. Review* VII, Part A (1982/3), p. 16.

[7] J. D. Archibald, *op. cit.*, p. 190.

[8] *Ibid.*, p. 195, and see also p. 196.

[9] *Ibid.*, p. 191.

[10] *Ibid.*, pp. 194-195.

be abrupt. Rather, they are spread vertically throughout an almost hundred-foot geological section."[1]

But, for one thing, Archibald is here speaking of Earth's *south* polar lands, which were as far removed from proto-Saturn's direct influence as terrestrial geography can permit. There is nothing in our scenario that disallows a slower decline in Cretaceous life in Earth's south polar regions. In fact, the absence of corresponding extinction layers in the Antarctic has been noted by others.[2] The same cannot, however, be said in relation to Earth's *north* polar area. I wish I could say that Archibald penned his work before the Arctic dinosaurs had been discovered, but this was not the case. He might not, however, have yet known about their vast extent. As we have seen, it is now believed that these Arctic dinosaurian hecatombs might turn out to be the most extensive in the entire world. Need we even mention that, in that case, dinosaurian extinction had to have been the most extreme in these very Arctic regions? And is it just the dinosaurs that we must account for? What about other fauna at other times in Earth's past history? If what we claim transpired, *all* past extinctions should have been more severe in northern latitudes. And this is precisely what we find.[3]

Even Fiorillo's surmise that the Arctic dinosaurs met their end in a flood finds correspondence in our scenario. The flood, of course, could have been the result of the encroaching ocean once Earth changed its rotational speed. But I hold a different opinion. As we have already explained, proto-Saturn's Birkeland current which stretched between it and Earth had a tornadic quality[4] which would have sucked a great quantity of northern waters which it then held in suspension. Once this polar columnar "jet" retracted,[5] it would have released its voluminous water content, which would have fallen in a colossal torrential downpour on Earth's north polar neighborhood. As I have described in some detail elsewhere,[6] the same thing transpired at a later time when man was a witness to the occurrence. There is therefore every reason to believe that it would also have occurred during the Cretaceous-Tertiary event. And since this release of water would have come from the retracting column, the flood it generated would have slightly preceded proto-Saturn's flare-up, and thus also the change in Earth's rotation. The Arctic dinosaurs would have therefore been the first to die.

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[1] *Ibid.*, p. 191.

[2] See here, for example, T. Van Flandern, "The Exploded Planet Hypothesis—2000," in E. Spedicato & A. Notarpietro (Eds.), *New Scenarios on the Evolution of the Solar System and Consequences on History of Earth and Man* (Bergamo, 2002), p. 50.

[3] See here, for instance, B. Bryson, *op. cit.*, p. 346

[4] *God Star*, pp. 429 ff.

[5] *Flare Star*, pp. 279 ff.

[6] D. Cardona, "The Demands of the Saturnian Configuration Theory," *AEON* VI:1 (February 2001), pp. 61 ff.

PART THREE

THE TOROIDS

Chapter 9

Celestial Bands

EPOCHAL ICE: RESETTING THE STAGE

The cause of ice ages has been debated since the beginning of the twentieth century. In 1903, a not very well known writer, Bâl Gangâdhar Tilak, had already refuted the causes that had been proposed in his day. These proposed causes included the diversion of the Gulf Stream by the sinking of the Isthmus of Panama; sudden changes in the distribution of land and water; the passage of our planet through hot and cold regions of space; variations in the Sun's radiation; alteration in the obliquity of the ecliptic; and the eccentricity of Earth's orbit.[1]

Most of these proposed causes were not that much different from what Milutin Milankovitch incorporated in his theory.[2] And despite the many objections that have been raised against it,[3] the Milankovitch theory continued to be parroted by most scientists,[4] while it also continued to be criticized by many others.

In 1953, J. Charlesworth, one of the prominent glaciologists of his time, was still referring to the onset of ice ages as "one of the greatest riddles in geological history" that "remains unsolved." As he wrote back then, "despite the endeavors of generations of astronomers, biologists, geologists, meteorologists, and physicists, it still eludes us."[5] Four years later he continued to berate his own discipline when he admitted that the "riot of theories" which had sprouted to account for the Pleistocene Ice Age ranged "from the remotely possible to the mutually contradictory and the palpably inadequate."[6] Upon reflecting on this situation *close to two decades later*, Gwen Schultz could only continue to stress the failure of science in explaining *why* ice ages ever occurred.

> "There must be a hundred theories [she wrote] but they all have 'holes' or lack substantiation, and none can be proved. Not one commands anything like general acceptance."[7]

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[1] B. G. Tilak, *The Arctic Home in the Vedas* (1903), pp. 453-454.

[2] See *Flare Star*, pp. 14-26, for the ups and downs of the Milankovitch theory.

[3] *Ibid.*

[4] See, for example, S. Clark, "Sun's Fickle Heart May Leave Us Cold," *New Scientist* (January 27-February 2, 2007), p. 12; R. Ehrlich, "Solar Resonant Diffusion Waves as a Driver of Terrestrial Climate Change," *Journal of Atmospheric and Solar-Terrestrial Physics* (May 2007); *New Scientist* (May 19, 2007), pp. 34-42.

[5] J. Charlesworth, "The Ice Age and the Future of Man," *Science Progress* (January 1953), p. 3.

[6] *Idem, Quaternary Era* (London, 1957), p. 1532.

[7] G. Schultz, *The Ice Age Lost* (N. Y., 1974), p. 67.

In the meantime a slew of different causes kept on being promoted to account for these periodic freezing events. One of these blamed ice ages on the influx of gamma rays,[1] which, as we have seen, some have proposed, as others continue to, as having been responsible for Earth's past mass extinctions.[2]

Another theory—not entirely new except for details—blamed it all on a solar cycle which encumbers the Sun's interior with "a dimmer switch" that "causes its brightness to rise and fall on timescales of around 100,000 years," which Robert Ehrlich claims to be "exactly the same period as between ice ages on Earth."[3]

Mind you, Ehrlich does concede that he cannot think of a practical way to test his theory since the time involved for the Sun's oscillation "is too gradual to be observed."[4] He however adds that there may be an indirect way to test it by observing red dwarf stars since these pass through much shorter oscillation periods.[5]

I could go on quoting other authorities and describing other theories on the subject, but why bore the reader with repetition? As of this writing, the situation has only changed in as much as newer theories kept being added to the list. All that this seems to have accomplished is to attract further detractors who then offered their own conjectures.[6] Some have even acted as if the problem has been solved. Take, for instance, William Ruddiman who stated that:

> "*Scientists have known since the 1970s* that three predictable variations in the Earth's orbit around the sun have exerted the dominant control over long-term global climate for millions of years...Over the past three million years, these regular changes in the amount of sunlight reaching the planet's surface have produced a long sequence of ice ages..."[7]

Or take the following as an additional example:

> "*It has long been speculated*, and recently calculated, that known changes in orbital geometry could alter the amount of sunlight coming in between winter and summer by about 10 percent or so and could be responsible for initiating or ending ice ages."[8]

Fair enough, "long been speculated" is closer to the truth than "scientists have known." But the "recently calculated" bit is hard to swallow when the same authorities additionally admit that the "precise causes of the longer intervals between warm and cold periods are not

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[1] S. Nadis, "Do We Live in a Cosmic Shooting Gallery?" *Astronomy* (November 2005), pp. 36-37.
[2] *Ibid.*, pp. 36 ff.
[3] S. Clark, *loc. cit.*
[4] *Ibid.*
[5] *Ibid.*
[6] See here, for instance, K. Ravilious, "White-Knuckle Planet," *New Scientist* (July 16-22, 2005), pp. 32 ff.
[7] W. F. Ruddiman, "How Did Humans First Alter Global Climate?" *Scientific American* (March 2005), p. 48 (emphasis added).
[8] C. J. Allègre & S. H. Schneider, "The Evolution of Earth," *Scientific American* (September 26, 2005, Special Edition), p. 11 (emphasis added).

yet sorted out."[1] And this concerns a problem that has even trapped iconoclasts such as the one who felt "reasonably certain that somehow the Sun has been ultimately responsible for the mammoth cold snaps."[2]

It is not that these authorities should be blamed since the Sun is the only known source of terrestrial heat and, therefore, the only cause that can be claimed for the lessening of that heat. But, as the British physicist John Tyndall noted back in 1883, here is where the dilemma lies, for in order for an ice age to develop, an awful amount of precipitation is required. Precipitation of such vastness, however, would have required immense evaporation and this, in turn, would have necessitated a great amount of heat.[3] As others have also noted,[4] under present thinking, what is required in effect is for Earth to have warmed up considerably. But if Earth heated up, how could it have been cold enough for an ice age to develop?

Contrary to popular belief, snow hardly ever falls in the Antarctic.[5] Which brings up the question as to how the miles-thick glaciers in Antarctica could have accumulated. Snowfall had to have been much more pronounced in ages past. But, again, for enough snow to have fallen in order to create the immense ice sheet which blankets the Antarctic continent, Earth would have had to have been much warmer in order to allow for the required evaporation of water in order for it to precipitate. At present, while water vapor encompasses about 4% per volume of air in equatorial humid zones, it is less than one part per million above the Antarctic.[6]

Another problem with present opinions concerning the onslaught of ice ages concerns the manner in which the glaciers were propelled. Here it is worthwhile to quote Derek Scott Allan and J. Bernard Delair because, no matter how much I may disagree with their overall scheme, they did place their finger on quite a few sore spots.

> "Although Agassiz and other early advocates of the Ice Age argued that the ice developed before the rise of the Alps and other high ranges [they wrote], modern glacialists all agree that high mountainous land is necessary to provide (and replenish) the snow from which glacier ice is derived, to supposedly produce the various geological phenomena allegedly characteristic of glacial conditions."[7]

But, as they then ask:

> "If, however, most of the world's present major ranges attained their existing elevations a mere 11,000 years ago,[8] where was the high land attracting heavy snowfalls

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[1] *Ibid.*

[2] F. B. Jueneman, *Raptures of the Deep* (Des Plaines, IL, 1995), p. 127.

[3] J. Tyndall, *Heat Considered as a Mode of Motion* (London, 1883), pp. 191-192.

[4] See here for instance, D. Menzel, *Our Sun* (N. Y., 1950), p. 248; I. Velikovsky, *Earth in Upheaval* (N. Y., 1955), pp. 130-133; V. Deloria, Jr., *Red Earth, White Lies* (N.Y., 1995), p. 92.

[5] G. Segrè, *A Matter of Degrees* (N. Y., 2002), p. 115.

[6] *Ibid.*

[7] D. S. Allan & J. B. Delair, *Cataclysm!* (Santa Fe, New Mexico, 1997), p. 37.

[8] See here *Flare Star*, (check Index under "diastrophism").

and providing the ice and the motive power for the alleged ice-sheets specifically stated to have *preceded* the modern uplands?"[1]

Worse still, how would the glaciers of ice ages *previous to that of the Pleistocene* have been powered to move downhill if the world's mountain ranges had not yet been uplifted to any considerable height?—And I *have* to say "to any considerable height" because it cannot be proven that these mountain ranges were *entirely* non-existent prior to the Pleistocene. But even if highlands might have been required to propel glaciers downhill, were they really needed to *attract* heavy snowfalls? After all, heavy snows continue to fall on prairies, steppes, and tundras, which are bereft of mountains, to this day.

Moreover, most iconoclasts continue to believe that the onset of ice ages, especially that of the Pleistocene, was sudden.[2] Most of these claims have unfortunately been based on the sudden freezing of Arctic fauna. Even Louis Aggassiz, among the first proponents of ice ages, and the man who did the most for the theory's eventual acceptance, held the same opinion.

> "A sudden intense winter that was to last for ages [he was led to assume] fell upon our globe; it spread over the very countries where these tropical animals had their homes, and so suddenly did it come upon them that they were embalmed beneath masses of snow and ice without time even for decay which follows death."[3]

It is not that faunal carnage did not take place at the end of the Ice Age, *although probably not during its onslaught.* But, as I have indicated elsewhere even if only in passing,[4] the refrigerated carcasses of the north were not deep-frozen at the beginning of the last Ice Age, *but a few thousands years after its end.*

In more recent years, the sudden seizure of the ice has also been proposed by Fred Hoyle.[5] And, to be sure, not all of the sudden-onslaught theories were based on the evidence of the frozen fauna. Hoyle himself based his belief on meteoritic bombardment,[6] a theory that continued to be espoused by Victor Clube and Bill Napier.[7] Genevieve Woillard, who based her findings on the fast replacement of pine, spruce, and birch forests, also reached the conclusion that the Ice Age "rushed upon Europe with terrifying speed."[8]

What I, on the contrary, aim to indicate is that while there is no doubt that the Pleistocene Ice Age ended suddenly and catastrophically,[9] its onset developed in a slow accumulation of snow and ice over a very long period much as orthodoxy would have it—although, perhaps, not over as long a period as presently believed.

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[1] D. S. Allan & J. B. Delair, *loc. cit.* (emphasis as given).

[2] See here especially, I. Velikovsky, *op. cit.*, pp. 108 ff.; C. Ginenthal, *The Extinction of the Mammoth*, comprising *The Velikovskian* III: 2-3 (1997), just about *in toto.*

[3] E. Lurie, *Agassiz: A Life in Science* (Chigago, 1960), p. 98.

[4] D. Cardona, "The Demands of the Saturnian Configuration Theory," *AEON* VI:1 (February 2001), pp. 66 ff.

[5] J. Gribbin, *Future Weather* (N. Y., 1982), p. 109.

[6] *Ibid.*

[7] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 124.

[8] *Nature*, Vol. 281, p. 558.

[9] See especially *Flare Star*, Part Five *in toto.*

That Earth's Arctic regions had basked in subtropical warmth has been known and written about since the 1700s.[1] Still considered something of a peculiarity, this fact is usually glossed over in most literature on the subject. And yet newer discoveries continue to point in the same direction even as the present work nears completion. For instance, it has recently been acknowledged that the Aleutian Islands and the nearby coast of Alaska have been occupied by man since the end of the Pleistocene Ice Age.[2] In reality, however, Arctic regions have been occupied for much longer than that, in fact from a time when the Pleistocene Ice Age is believed to have been at its worst. Take, as an example, the discovery of tools, bones, and an incised mammoth tusk, to say nothing of plant remains, that came to light in 2001 in Russia's Arctic regions and which have been dated to at least 30,000 years ago.[3] As Russian archaeologists have claimed, "spear foreshafts made of mammoth ivory and woolly rhino horn, stone tools, and bones that display signs of butchering" prove that humans were then living in what are now the coldest areas of Siberia.[4] If nothing else, this proves that modern humans or Neanderthals had managed to live there during the worst of the last Ice Age. In fact, it has been ascertained that the Neanderthals were among the first humans to inhabit the Arctic.[5] This has been taken to mean that "our ancestors had adapted to the climate,"[6] but the remains of plants discovered there[7] actually speak for an ice-free environment.

Sometimes one cannot help being amazed at the incongruity of the theories offered to circumvent this quandary. A good example comes to mind in the case of the dried land that bridged the Bering Straits across which both beasts and man are supposed to have trekked from Asia into North America. The straits in question were supposedly joined by the land that was exposed by dropping sea levels due to the evaporated water that went into the creation of the Pleistocene glaciers. The dilemma here is that the land-bridge itself was not covered by the advancing glaciers. At present this area receives but little precipitation, and this has been used as the reason behind the ice-free land-bridge. But, as evidence indicates, it was not just the land-bridge itself. As David Hopkins explained:

> "Little moisture falls on this part of the Arctic, and thus the *land bridge, Alaska, and the northern Yukon* escaped the ice that entombed the rest of Canada. Sealed off from North America, this area became in effect part of Siberia—a domain we know as Beringia."[8]

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[1] J. Godwin, *ARKTOS: The Polar Myth in Science, Symbolism, and Nazi Survival* (London, 1993), p. 186.

[2] *The Times* (March 14, 2005).

[3] *National Geographic* (August 2001), p. 110.

[4] K. Kostel, "Team of Archaeologists Crack Siberia's Secrets," *Discover* (January 2005), p. 69.

[5] W. R. Leonard, "Food for Thought," *Scientific American* (December 2002), p. 113.

[6] K. Kostel, *loc. cit.*

[7] *National Geographic* (August 2001), p. 110.

[8] T. Y. Canby, "The Search for the First Americans," *National Geographic* (September 1979), pp. 334-335 (emphasis added).

However, "little moisture falls on this part of the Arctic" *to this day*. But the area on both sides of the Bering Straits is mostly tundra, bearing little vegetation beyond lichen and moss. And yet it has been claimed that "Beringia's *broad grasslands* became a highway for Asian animals passing into the New World—mammoths, mastodons, bison, musk-oxen, deer."[1] And with these came "the beasts that preyed on them—lions, saber-toothed tigers, short-faced bears, swift dire wolves, swifter cheetahs."[2] How could a land which now bears nothing but lichen and moss have contained grasslands "broad" enough to sustain this massive menagerie of animals, to say nothing of man himself, *at the height of the Ice Age*?

Past warmth in Earth's Arctic regions received an additional boost during the very progress of the present work. This came about through the drilling of new ice cores. Thus, while the Greenland ice cap is composed of pure compacted ice, some of its lower sections are still mixed with bottom sludge. Such, for instance, was the case at the famous DYE-3 site. Eske Willerslev, then from the Copenhagen University in Denmark, found what he was hoping to find in exactly this type of mud—genetic material from past remains which included grain, pine, yew, and alder, together with traces of insects such as butterflies, moths, flies, and beetles.[3]

Analysis of fossil DNA from these vestiges indicated "a biological environment, which is completely different to what we see today." Dated to 450,000 years ago, before the onslaught of the last Ice Age, these results are "direct proof that there was forest in southern Greenland" which must have had "a relatively mild climate."[4]

Northern Greenland, too, remained free of glaciers during the Ice Age. Ice core drilling hit bedrock dated to 120,000 years ago and, like their southern counterparts, the retrieved cores showed evidence of vegetation, which would mean that no ice-cap could have existed in Greenland at that time.[5]

Moreover: "No marginal moraines that are definitely older than Holocene have been found in northern Greenland," it has been ascertained.[6] Evidence on the west coast, north and south of Disko Bay, indicate that the area was ice free even *before* the Holocene,[7] which would mean during the Pleistocene epoch. An ancient tree, with a trunk "thicker than a man's body," still standing upright, was recovered from that vicinity. As Allan and Delair note: "Had this region ever been glaciated...this tree could never have flourished" while, had it flourished at some previous age, "it would have been demolished and completely removed" by the advancing glaciers.[8]

Just as important, further cores from Greenland have revealed that glacial ice dating from 100,000 to 10,000 years ago was different from that which formed later. This earlier ice, it

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[1] *Ibid.*, p. 335 (emphasis added).

[2] *Ibid.*

[3] "Oldest DNA Ever Recovered Suggests Earth Was Warmer," PHYSORG.com (July 5, 2007).

[4] *Ibid.*

[5] P. Clapham, letter to the editors, *Chronology & Catastrophism Workshop* (2005:1), p. 3.

[6] G. H. Denton & T. J. Hughes, *The Last Great Ice Sheets* (N. Y., 1981), p. 50.

[7] *Ibid.*, pp. 48-49.

[8] D. S. Allan & J. B. Delair, *op. cit.*, p. 248.

was found, contained an unusual ratio of oxygen isotopes.[1] What this indicates is that the Pleistocene ice was formed in a different atmosphere than the later ice which eventually covered what had once been the ice-free pole at the very top of the world. In our scheme, that different atmosphere would have been the one which had enveloped Earth while it was still in tandem with its proto-Saturnian sun outside the demarcation of the Solar System. It was different because proto-Saturn's flare-up at the end of the Pleistocene had not yet lessened its previous greater density.

And that the earliest evidence of life on Earth—which would definitely have required warmth—is to be found in earth's north coldest regions kept on gaining acceptance.[2]

FURTHER EVIDENCE

Once proto-Saturn's jet-like *axis mundi* is understood as a planetary tornado, it should become evident that it would have sucked up any loose material that lay directly beneath it, and this would have included much, if not all, of the water that might have found its way into the Arctic depression.[3] With such massive churning and sucking over the ages, the Arctic Ocean should either not have existed, or it should have been much diminished, during the Ice Age. This, Flavio Barbiero noted, is evidenced by the fact that Siberia was populated "up to its northernmost regions, *well inside the Arctic Sea*, by one of the most impressive zoological communities of all times."[4] Once the *axis* retracted itself,[5] the water it had held suspended in its vortex would have been released as rain.

Additionally, proto-Saturn's immobile placement,[6] to say nothing of its close proximity, would have exerted tremendous tectonic influences on the area directly beneath it. Supplementary evidence includes the recently discovered "remarkable hot zone" beneath the Arctic ice "where Earth's thick rocky crust has come apart at the seams and lava and scalding water spew out of volcanoes and hot vents." This zone occurs along the Gakkel Ridge, five kilometers beneath the ice, which stretches all the way along the sea floor from Greenland to Siberia. This ridge is still active with *at least twenty volcanoes* rising from it, one of which erupted in July of 1998. Hydrothermal vents also abound.[7] If this is going on at the moment, it would have been occurring during those earlier ages when the Arctic was still free of ice.

One more thing to keep in mind is that if ice ages were really caused by an overall terrestrial cooling due to Earth's orbital fluctuations and/or the Sun's whimsical antics, those areas just outside the glaciers' demarcation should have also cooled to some extent, even if not cov-

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[1] W. Dansgaard, *et al.*, "One Thousand Centuries of Climate Record from Camp Century on the Greenland Ice Sheet," *Science* (October 17, 1969).

[2] J. W. Valley, "A Cool Early Earth?" *Scientific American* ((October 2005), p. 60.

[3] See here D. Cardona, *op. cit.*, pp. 61-62.

[4] F. Barbiero, "Changes in the Rotation Axis of Earth After Asteroid/Cometary Impacts and their Geological Effects," *Fifty Years After Worlds in Collision by Velikovsky: Classical and New Scenarios on the Evolution of the Solar System* (Bergamo, 2002), p. 89 (emphasis added).

[5] *Flare Star*, pp. 279 ff.

[6] See here *God Star*, pp. 465-466; *Flare Star*, pp. 137-145.

[7] M. Munro, "Volcanoes and Hot Vents Found Under Arctic," *The Vancouver Sun* (June 26, 2003), p. A8.

ered by glacial ice. Oceanic waters, especially, should have succumbed to this cooling. And, to be sure, reefs just off Barbados have been claimed to show exactly that—in other words a cooling of the tropical ocean during the height of the Ice Age. However, as Charles Ginenthal noted, "a major study by the Climate Long-Range Investigation and Mapping Program (CLIMAP) which analyzed plankton, reported in 1981, found no such evidence for cooling."[1] As Richard Monastersky, cited by Ginenthal, reported:

> "Oceanographers who study deep-sea sediments detect signs that the tropical seas weathered the glacial epoch with remarkable stability, hardly cooling it at all...*This discrepancy troubles climate researchers* because it raises the possibility that their models lack a critical element that will hinder their ability to accurately predict future changes."[2]

And on land, also just beyond the ice sheet's demarcation, at Meadowcroft Rockshelter in Pennsylvania, the remains of animal bones from the site's lower levels, dated around 14,000 years ago, indicate that the area had basked in a warm climate "rather than the icy conditions" that should have existed at the time.[3]

While the above may be seen by some as redundant evidence in a tedious argument that has already been covered in both our previous volumes,[4] I have included this additional documentation in order to stress its importance. When one considers what has been brought to light through the totality of this data, one is bound to realize that the glaciated land of past ice ages constituted *a wide ribbon wrapped around Earth's northern hemisphere—an ice band rather than the usually posited ice cap.* That this ribbon failed to include the topmost of our globe has been explained as having been due to the direct warmth received from the proto-Saturnian sun that was held immobile above Earth's northern pole. But *what kept the ice from encroaching further south than it actually did*? Why did the ice fail to advance any further? One would think that in the thousands of years during which ice ages lasted, Earth's burden of ice should have marched on. There is no point in claiming that the tropics remained warm enough to keep the ice from advancing further since, in effect, the entire world had to have been hot enough for the vast amount of evaporation needed to create enough air-laden moisture to precipitate onto the land. But, as already argued, if Earth had been that warm, how could an ice age have ensued? Why did the precipitation not fall as rain—and warm rain at that? Besides, as we have also shown,[5] the proto-Saturnian system's enveloping plasmasphere would have radiated and reflected heat to all terrestrial latitudes. So how could that ribbon of land been frozen over at any time? And why only that ribbon?

It is this multi-faceted dilemma that we shall now attempt to solve.

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[1] C. Ginenthal, "Ice Core Evidence," *The Velikovskian* II:4 (1994), p. 62; see also R. Monastersky, "Coral's Chilling Tale: Ancient Reefs May Resolve an Ice Age Paradox," *Science News* (February 19, 1994), p. 124.

[2] R. Monastersky, *loc. cit.*, (emphasis added).

[3] P. James & N. Thorpe, *Ancient Mysteries* (N. Y., 2001), p. 356 (and compare to map on p. 353).

[4] *God Star*, pp. 361 ff.; *Flare Star*, pp. 80 ff., 505.

[5] See here, especially, *God Star*, pp. 297 ff.

There was a time when planets were not believed to be able to form around low-mass objects. By the twenty-first century, however, newer discoveries forced astronomers not only to accept that planets *can* form around low-mass bodies, but that they actually do.[1] Needless to say, brown dwarfs fit this class of celestial phenomena. In fact they fit more than just that. "Some young objects that people are calling brown dwarfs are really low-mass stars," claims Laird Close, and "things that people are calling free-floating planets, in almost every case, are likely to be low-mass brown dwarfs."[2] That the sub-brown dwarf proto-Saturn acted as a sun—that is, a low-mass star—should not therefore be seen as an outrageous proposition.

The first planet associated with a brown dwarf star, in the constellation Hydra, came to light in April 2004. It was not only detected, but actually imaged—the first direct image of an extrasolar planet.[3] At the time of the discovery, there was still some uncertainty concerning whether the planet was actually *orbiting* the brown dwarf.[4] But that the dwarf and the planet constitute a binary system was ascertained through the fact that both of them "appear to be moving in the same direction at the same speed across the sky."[5] And, in keeping with the above, it was noted that the system bears a close resemblance to an extremely low-mass binary star.[6]

Another possible planet has also been imaged around the nearby brown dwarf designated GQ Lupi and, as usually transpires, its discoverers have attempted to claim the right to the first imaged exoplanet since, according to them, the one associated with the Hydra dwarf remains unconfirmed.[7] Others disagree.[8]

Yet another planet, 7.5 times Earth's mass, has been discovered orbiting the red dwarf star designated Gliese 876.[9] Actually *three* planets have been detected orbiting this particular red dwarf. The third body "made headlines because it is so much like Earth." As Mark Alpert reported: "The newly discovered world...is most likely a rocky body only about twice as large as Earth."[10]

Brown dwarfs themselves can also orbit around *red* dwarfs—at least one such has been found around the red dwarf known as Gliese 229.[11] More than that, an entire planetary system has been detected to be forming around a brown dwarf which is barely larger than a giant planet.[12] The scenario presented in this work cannot therefore be seen as preposterous. As the

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[1] See here, for instance, R. Naeye, "A Bonanza of Exoplanet Discoveries," *Sky & Telescope* (May 2005), p. 19.

[2] J. Roth, "Newfound Star Sparks Debate," *Sky & Telescope* (April 2005), p. 22.

[3] D. Overbye, "Scientists Say Red Speck is Indeed Huge New Planet," *The New York Times* (April 30, 2005).

[4] R. Burnham, "First Exoplanet Imaged?" *Astronomy* (April 2005), p. 20.

[5] D. Shiga, "Exoplanet Image Confirmed?" *Sky & Telescopt* (April 2005), p. 22.

[6] *Ibid.*; see also R. Naeye, "Exoplanets: The Heat is On," *Sky & Telescope* (June 2005), p. 19.

[7] R. Burnham, "Exoworlds: Fights Over First Light," *Astronomy* (July 2005), p. 30.

[8] D. Overbye, *loc. cit.*

[9] I. Semeniuk, "Planet Quest," *Sky News* (September/October 2005), p. 12.

[10] M. Alpert, "Red Star Rising," *Scientific American* (November 2005), p. 28.

[11] G. Basri, "A Decade of Brown Dwarfs," *Sky & Telescope* (May 2005), p. 36.

[12] *New Scientist* (February 12, 2005), p. 12.

compilers of *Chronology & Catastrophism Workshop*'s "Monitor" section noted: "The Saturn scenario suddenly does not seem so incredible after all!"[1]

The brightest brown dwarf that had been discovered as of 2003 "has a visual magnitude as faint as 21 and a red magnitude of 18, though it glows at magnitude 10.8 in the 2-micron infrared band"[2]—which, needless to say, is much dimmer than the Sun. To tell the truth, red dwarfs have been posited to contain "less than half the mass of the sun and are hundreds of times dimmer."[3] Brown dwarfs are even fainter. This, however, should not be seen as an impediment to the origin or maintenance of life on an Earth-like planet associated with a brown dwarf. As we have already seen, orthodoxy itself has posited that the Sun was much dimmer in Earth's past than it is now.

There are those who, however, practice caution, as indeed they should, when it comes to this particular question. "The details of the evolution of [Earth's] original atmosphere are debated," wrote Claude Allègre and Stephen Schneider, "particularly because we do not know how strong the sun was at that time."[4] And although these authors claim that some facts "are not disputed," they still maintain that "the problem of the sun remains unresolved."[5] They do, however, report that, according to one hypothesis, in a more remote age, "the sun's power was only 75 percent of what it is today."[6] "This possibility raises a dilemma," they go on, and then ask: "How could life have survived in the relatively cold climate that should accompany a weaker sun?"[7]

In an attempt to circumvent the problem, they next considered Carl Sagan's catch-all theory, that of a "super-greenhouse effect" brought about by a former abundance of methane and ammonia which would effectively have trapped infrared radiation.[8] Our scenario does not suffer from this problem because brown dwarfs are known to be prominent propagators of just such infrared dispersal. Add to that Earth's closer proximity to proto-Saturn, and the enigma resolves itself.

We have already shown in a previous volume that planetary companions of dwarf stars can harbor life.[9] In fact it has been stated that "the best place to find life in our galaxy could be on planets that circle the small but common stars known as red dwarfs."[10] Because the habitable zone of such a planet would be closer to its primary than Mercury is to the Sun, it is posited that such a planet would have to be in phase-lock with the dwarf. This would mean that, very much like our Moon, the planet would always point the same hemisphere to its primary. Originally, as reported by Ken Croswell, this led to certain difficulties since the day

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[1] P. Clapham, *et al.*, "No Standard Planetary System," *Chronology & Catastrophism Workshop* (2005:2), p. 19.

[2] A. MacRobert, "The Brightest Brown Dwarf," *Sky & Telescope* (April 2003), p. 27.

[3] M. Alpert, *loc. cit.*

[4] C. J. Allègre & S. H. Schneider, *op. cit.*, p. 8.

[5] *Ibid.*, pp. 8-9.

[6] *Ibid.*, p. 9.

[7] *Ibid.*

[8] *Ibid.*

[9] *God Star*, pp. 343-350; see also M. J. Heath, *et al.*, "Habitability of Planets Around Red Dwarf Stars," *Internet Digest* (2002:2), p. 3.

[10] M. Alpert, *loc. cit.*

side of such a planet would fry, while its night side would be so frigid that its atmosphere would probably freeze.[1] One way out of this dilemma was to consider a thicker atmosphere that would allow the transport of heat from the day side to the night side.[2] More recent computer models have additionally shown that if the atmosphere was to contain "modest amounts of carbon dioxide," it would also spread the heat around.[3]

While this is in keeping with our postulate that Earth might indeed have possessed such a denser atmosphere,[4] and perhaps even "modest amounts of carbon dioxide," our scenario involves an additional aspect which counters the heat dilemma. Although Earth's placement directly beneath proto-Saturn's south pole would also involve one hemisphere permanently facing our primeval primary, its enveloping opaque plasmasphere, as often indicated in our works,[5] would have reflected heat to all terrestrial latitudes.

An additional concern of mainstream astronomers is that a planet around a dwarf star would be prone to the superflares that such dwarfs frequently produce. As Mark Alpert indicated, "the resulting torrents of charged particles could strip the atmosphere off any nearby planet."[6] But then he himself remarked that: "If the planet had a magnetic field...it would deflect the particles from the atmosphere."[7] And does not Earth possess such a field?

It might again be pointed out that red dwarfs, to which most of the above applies, are not the same as *brown* dwarf stars. But while some brown dwarfs *are* considered to be brown,[8] in reality most of them are just as red as red dwarfs. Besides, where does one draw the line between red and so-called brown dwarf stars? As Gibor Basri pointed out, "it appears that brown dwarfs are produced in all possible masses between planets and stars."[9] And then, after all is said and done, it is not as if the possibility of life-bearing satellites around *brown* dwarfs has never been postulated by mainstream astronomers.[10]

Even so, one might argue that, as the posited *sub*-brown dwarf star, proto-Saturn might not have been massive enough to hold on to a planet like Earth. As Basri also noted, "all brown dwarfs are roughly the size of Jupiter—the heavier brown dwarfs are simply denser than the lighter ones."[11] The mass, as opposed to the size, of most brown dwarfs has been estimated to range from between 40 and 60 times that of Jupiter.[12] But how can this be so—and claimed by the same authority—if "brown dwarfs are produced in all possible masses between planets and stars"? As Ray Jayawardhana pointed out, the line between Planetary Mass Objects and

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[1] K. Crosswell, "Red, Willing and Able," *New Scientist* (January 27, 2001), p. 30.

[2] *Ibid.*

[3] M. Alpert, *loc. cit.*

[4] *God Star*, pp. 346, 348, 380, 385; *Flare Star*, p. 331.

[5] *God Star*, pp. 297, 340 ff.; *Flare Star*, (check Index under "plasmaspheres").

[6] M. Alpert, *loc. cit.*

[7] *Ibid.*

[8] G. Basri, *loc. cit.*

[9] *Idem*, "The Discovery of Brown Dwarfs," *Scientific American* (2004 Special Edition), p. 31.

[10] A. Lloyd, "The Extended Habitable Zone," *Internet Digest* (2002:2), p. 3.

[11] G. Basri, "The Life Cycle of Brown Dwarfs," *Scientific American* (2004 Special Edition), p. 31.

[12] B. Dorminey, "Dark Threat," *Astronomy* (July 2005), p. 45; G. Basri, *loc. cit.*

brown dwarfs is not only blurred, there could even be an overlap in their mass.[1] One brown star—2MASSS 0415-0935—has been estimated to "weigh so little that it falls in the range of what astronomers would usually call a giant planet."[2] Defining these borderline bodies, notes Frederick Vrba, is "not so obvious since these objects have the same masses, chemical compositions, and radii as planets."[3]

True, a *sub*-brown dwarf like proto-Saturn would be even less massive. So the question remains: Would proto-Saturn have been massive enough to hold on to Earth? Why not? If relatively puny asteroids can hold on to satellites[4]—something that was unheard of in the mid-twentieth century—what would be so amazing about a sub-brown dwarf holding on to an Earth-sized planet? Besides, who is to say how much more massive proto-Saturn may have been prior to its flare-up and entry into the Sun's domain of electrical influence?

None of this, however, serves to extricate us from the Ice Age quandary. None of the brown dwarf characteristics noted above and elsewhere in this work assist us in discovering how Earth could have been both warm enough to produce vast quantities of evaporation from its oceans, while at the same time being cold enough to freeze a wide ribbon of northern latitudes. But then, if Earth's own weather fails to present us with the solution to this problem, might not proto-Saturn's own climate hold the answer? For one thing, dwarf stars have another advantage over stars as possible environments for life because they shine longer, even though some claim that they do not brighten with age.[5] Even in our own scenario, as I hope to indicate in future volumes of this series, the brightening of proto-Saturn due to its ultimate flare-up was only temporary, as so, also, would have been all previous flare-ups.

Luminosity, however, is one thing; temperature is another. Even the Sun, after all, has weather patterns.[6] And so do brown dwarfs stars.[7]

In fact, as Maia Weinstock reported, "evidence suggests that weather is ubiquitous on planets, stars, and everything in between."[8] Even cool stars have now been realized to be shrouded in atmospheric clouds. Not surprisingly, so do brown dwarfs,[9] which have been found to harbor "cloudy, stormy atmospheres."[10] Some reports have been even bolder. "Astronomers *have seen* planet-like weather on brown dwarfs," wrote Richard Talcott, "marking the first time such weather has been *observed* on objects outside the solar system."[11]

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[1] R. Naeye, "Lonely Planets?" *Astronomy* (June 2003), p. 41.

[2] D. Tytell, "The Coolest Brown Dwarf," *Sky & Telescope* (April 2003), p. 27.

[3] *Ibid.*

[4] R. Burnham, "Misfit Minor Planet," *Astronomy* (October 2003), p. 32; M. Carroll, "The Long Goodbye," in *ibid.*, p. 39; D. Durda, "Odd Couples," in *ibid.* (December 2005), pp. 54 ff.

[5] M. Alpert, *loc. cit.*

[6] M. Weinstock, "Stormy Weather Brewing on the Sun," *Discover* (September 2002), p. 13.

[7] *Ibid.*

[8] *Ibid.*

[9] A. MacRobert, "Follow that Story," *Sky & Telescope* (April 2002), p. 28.

[10] "Astronomers Find Jupiter-like Weather on Brown Dwarfs," University of California-Los Angeles at (http://www.ucla.edu/) dated May 27, 2002 (emphasis added).

[11] R. Talcott, "First Forecast: Cloudy; No Rain," *Astronomy* (December 2002), p. 32 (emphasis added).

Thus, according to Adam Burgasser, the "best analogy to what we witness on these objects are the storm patterns on Jupiter."[1] In fact, as Mark Marley phrased it: "If you line a mug shot of Jupiter with these guys, it is just a very low-mass brown dwarf."[2] And so why not Saturn, even though, at present, it is less massive than Jupiter? And since sub-brown dwarfs have been classed with Planetary Mass Objects,[3] it is not surprising to learn that astronomers have gone on record in reporting that, in their old age, these Objects "look very much like Jupiter."[4] More than that: "In this sense, isolated PMOs [that is, Planetary Mass Objects] give us a golden opportunity to see what Jupiter *and Saturn* were like in their youths."[5]

But do dwarf stars really get dimmer with age?

Kurtis Williams, for one, believes that, as a red dwarf ages, it becomes brighter, and even slightly hotter, *before* it gradually fades.[6] And let us not again stress the supposed distinction between red and brown dwarf stars. Andrew Ackerman was discussing *brown* dwarfs when he described their appearance as "a faint glow, like an ember from a fire that gives off both heat and light energy *as it dims*."[7]

> "Astronomers expected brown dwarfs, like most objects in the universe, to grow steadily fainter as they cool. However, new observations showed that during a relatively short phase, brown dwarfs appear to get brighter as they cool."[8]

Is this not, again, in keeping with our proto-Saturnian scenario?

And yet, it should in fairness be noted that, in the long run, brown dwarfs do cool with age.[9] Granted that they may warm up again following every flare-up, once the excessive heat from the flare dies down, brown dwarfs would return to their previous temperatures, from where they would continue to gradually dim and cool. Nevertheless, as Alpert noted: "One billion years from now, intensifying solar radiation will make Earth uninhabitable—[although, to be sure, this has more recently given rise to serious doubts[10]]—but the galaxy's M dwarfs [to use their astronomical designation] will burn steadily for hundreds of billions of years."[11]

Brown dwarf clouds have been theorized to form through condensation of various compounds,[12] and, once formed, they then act to further alter the dwarf's temperature.[13] Such

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[1] *Ibid.*

[2] "Astronomers Find..." (see above).

[3] R. Naeye, *op. cit.*, p. 40.

[4] *Ibid.*, p. 41.

[5] *Ibid.* (emphasis added).

[6] K. Williams, "Ask Astro," *Astronomy* (September 2005), p. 68.

[7] "Astronomers Find..." (see above)

[8] *Ibid.*

[9] J. Winters, "A Brief Tour of a Bad Cosmic Neighborhood," *Discover* (April 1998), p.58.

[10] J. R. Minkel, "Red Giant Survival," *Scientific American* (November 2007), p. 34.

[11] M. Alpert, *loc. cit.*

[12] "Astronomers Find..." (see above).

[13] A. MacRobert, *loc. cit.*

cloudy cool dwarfs in fact exist.[1] Most of these have been found to contain methane in their atmospheres, which has been interpreted to indicate surface temperatures below 1,300 Kelvin and, at least in theory, an age of up to two billion years. Such low heat brings older brown dwarfs to near-planetary temperatures.[2] According to some authorities, they can even cool below that. One of them has been described as "only a few hundred degrees hotter than an oven cooking a roast."[3] It glows "with only two millionths of the Sun's luminosity—almost entirely in the infrared" with a spectrum that "shows signatures of methane and water vapor."[4] But when Govert Schilling claims that an Earth orbiting a brown dwarf would be "just 20 degrees above absolute zero," he is exaggerating because, while dwarf stars may reach such low temperatures, they do not *commence* their astral careers that cold.

A hasty judgement devoid of proper consideration or, worse still, one reached through dire frustration, might consequently tempt one to blame Earth's Pleistocene cold climate on proto-Saturn's fluctuating heat. This fluctuation might then be held to account for those warm periods that separated successive ice ages in Earth's past, especially when those periods have been determined to have been even warmer than Earth's climate presently allows. But that this cannot be the *entire* answer we have been looking for needs to be stressed. Had that been the *sole* cause—had ice ages come about due to proto-Saturn's *episodic* frigid temperatures—how could Earth have remained warm enough during the same periods to generate the necessary oceanic evaporation required for the prolonged precipitation that was in turn needed to produce an ice age? Had Earth responded to such proto-Saturnian freezing, it would have frozen all over. After all, if proto-Saturn's plasmasphere acted to reflect heat back to all terrestrial latitudes, it would have acted just as well to reflect back proto-Saturn's frigidness. Why, we are forced to ask once more, did Earth's glaciation restrict itself to that particular ribbon of land?

TERRESTRIAL RINGS

A ring of frozen land around the north pole—which is what the area covered by the Ice Age glaciers amounts to—calls to mind some sort of planetary ring around our globe. This is not a new idea. Various rings around Earth had already been posited by other scenarists. Some of them, as we shall see, were even proposed to account for the very onslaught of ice ages.

As early as 1884, Oskar Reichenbach, one of the earliest catastrophists on record, theorized that, due to Earth's early equatorial eccentricity, our globe "cast off" a sizeable chunk as well as a series of rings which "became envelopes." In time, the sizeable chunk became the Moon while the "remnants" of the rings "gradually descended" in "catastrophic downpours of solids, liquids, and gases during periods of convulsions." The world's oceans were formed from this catastrophic downpour.[5]

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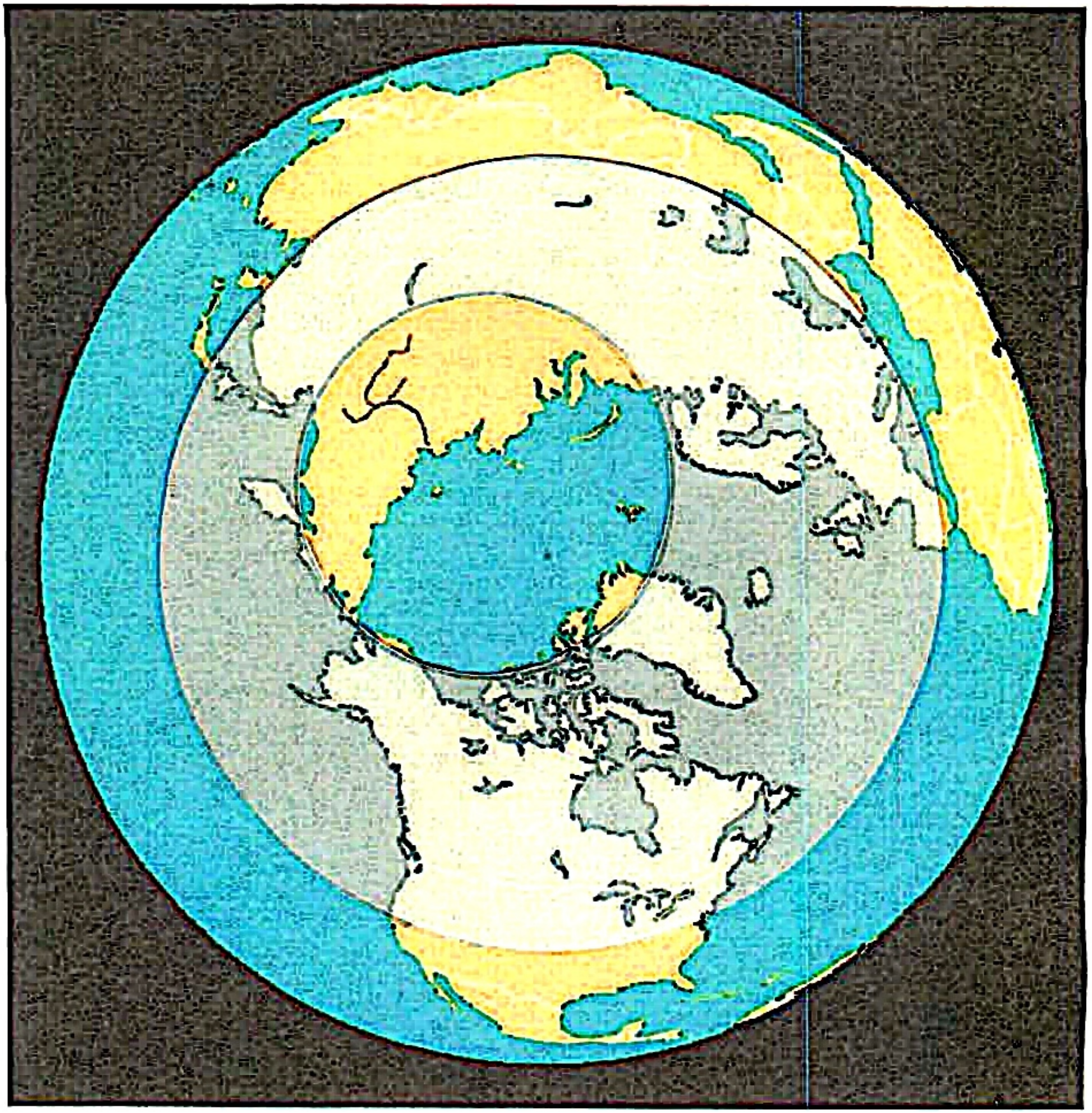
[1] *Ibid.*

[2] G. Basri, "The Discovery of Brown Dwarfs," *Scientific American* (2004 Special Edition), p. 33.

[3] D. Tytell, *loc. cit.*

[4] *Ibid.*

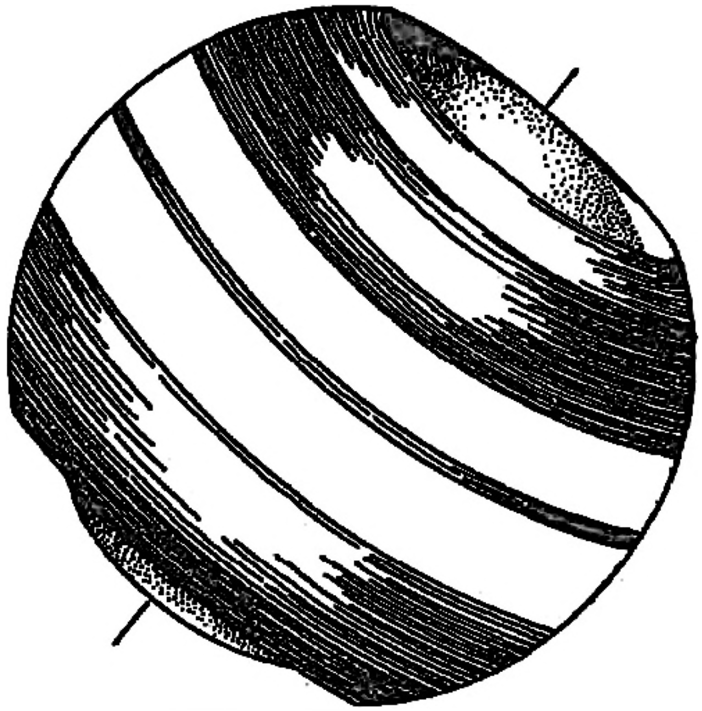
[5] O. Reichenbach, *On Some of the Remarkable Features in the Evolution of the Earth* (London, 1884), p. 9.



Ideal view of the glaciated ribbon of land during the Pleistocene Ice Age.

In 1886, Isaac Newton Vail also came to the conclusion that Earth had once been girdled by a doughnut-like structure of ice crystals which, in keeping with the Book of *Genesis*, he alluded to as the firmament.[1] Even more than that, a system of rings around the planet Jupiter had also been foreseen by Vail. "With his [that is Jupiter's] moons almost in the plane of

[1] I. N. Vail, *The Waters Above the Firmament* (1886), *in toto.*



Isaac Newton Vail's terrestrial canopy as proposed in 1886.

the planet's equator," he wrote, "I am forced to the conclusion that he once had rings."[1] Since the present Jovian rings are seen by some as remnants of once denser bands, Vail's insight concerning a former system of rings around Jupiter, while not exactly a prediction, can be said to have been vindicated. But what astronomer would be willing to give him his deserved credit?

In 1913, in his *Welt-Eis-Lehre*, Hans Hoerbiger likewise posited a temporary ring of debris around Earth which had resulted from the break-up of a previous terrestrial satellite.[2]

A similar ring around Earth was proposed by Dolph Earl Hooker in 1958, which theory we will be discussing in more detail below.

And a temporary icy ring around Earth was still once more theorized as the result of a disintegrating icy satellite that approached too close to Earth, this time by Donald Patten, in 1973.[3] In both this case and that of Hoerbiger, the dissolution and precipitation of the contents of this ring was held responsible both for the dumping of ice on Earth and for the occurrence of Noah's flood.[4]

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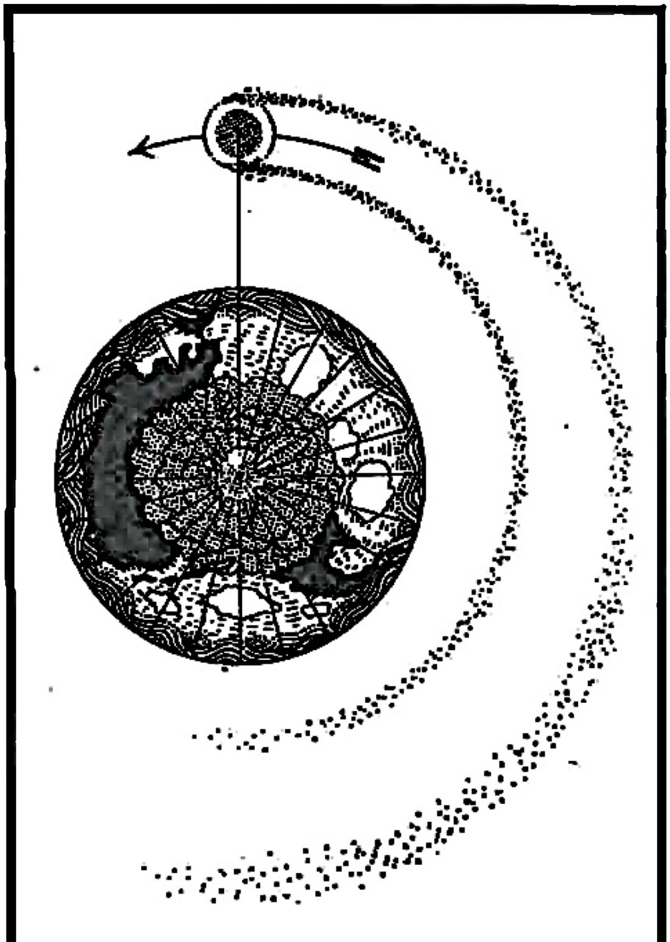
[1] *Idem*, "Eden's Flaming Sword," *Selected Works of Isaac N. Vail*, Vol. I (Santa Barbara, California, 1972), p. 3 of "Vail's Flaming Sword."

[2] This theory is now best available in H. S. Bellamy, *Moons, Myths and Man* (London, 1949).

[3] D. W. Patten, *et al.*, *The Long Day of Joshua and Six Other Catastrophes* (Seattle, 1973), p. 91; see also W. I. Thompson III, "Extraterrestrial Origin of the Ice Age," in D. W. Patten (Ed.), *A Symposium on Creation* VI (Seattle, 1977), pp. 91 ff.; *Flare Star*, pp. 53-55.

[4] See further D. W. Patten, *Catastrophism and the Old Testament* (Seattle, 1988), pp. 34-35.



The break-up of a former terrestrial satellite as theorized by Hans Hoerbiger in 1913

Also in 1973, Charles McDowell reversed the process by assuming that terrestrial rings had been formed by the disruption of the oceans (caused by a passing body?) which erupted into space, and which later precipitated back to Earth to cause the same flood of Noah.[1]

In 1988, even David Talbott tentatively proposed "an Earth-surrounding band of dust or ice" which he believed might have occluded "the terrestrial view of the Sun."[2]

In a more serious vein than most catastrophist aficionados, Henry Zemel touched on a related topic in 1997 by postulating that the Solar System "had been swept clear of asteroids" by "a system of shrinking solar rings" together with "an extensive—and shrinking—ring system around the major planets."[3] As Zemel wrote: "Solar rings could have formed a billion years in the past, and again a million years ago, and also as recently as the beginning of civilization."[4]

What Zemel does not seem to have realized is that, seven years previously, a "huge ring," very much like the ones he envisioned, had actually been discovered surrounding the Solar System beyond the orbit of Pluto. Considered to be composed of "relatively large particles, bigger than BBs," the ring appears to be of "substantial thickness" and "tilted up outside the plane of the ecliptic." The verdict of astronomers was that "it's some sort of debris associated with comets."[5]

In 2001, Moe Mandelkehr also posited a ring around Earth. In a summary of his work on this particular topic, he explained his hypothesis in these words:

> "As postulated in earlier papers, dust in the Earth's North Polar region at 2300 BC initiated widespread geophysical changes. The dust was a result of the Earth encount-

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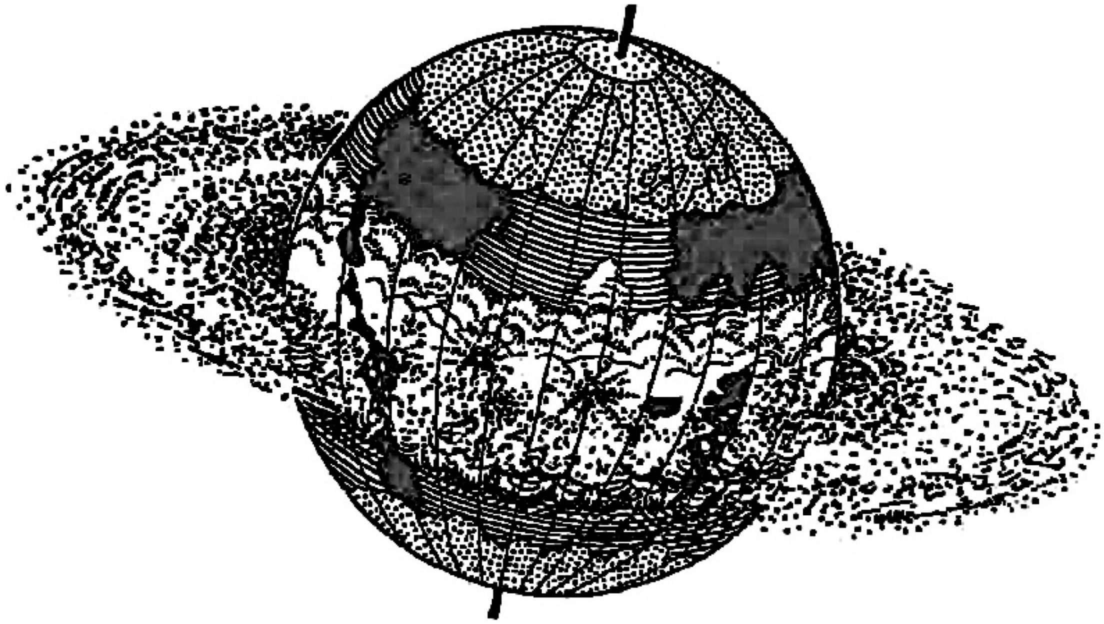
[1] C. McDowell, "Velikovsky and Christian Catastrophists," *Journal of the American Scientific Affiliation* (December 1973), pp. 141-142.

[2] D. Talbott, "On Testing the Polar Configuration," *AEON* I:2 (February 1988), p. 123.

[3] H. Zemel, "Circling the Rings," *AEON* V:1 (November 1997), pp. 23 ff.; see also R. W. Wescott *et al.*, "Celestial Rings," *AEON* V:3 (December 1998), pp. 7-9.

[4] H. Zemel, *op. cit.*, p. 30.

[5] Washington (IP), "BB-Like Ring Surrounds Solar System," *The Sun* (October 29, 1983), p. A11.



Debris ring around Earth as envisioned by Hans Hoerbiger in 1913.
Similar cosmic scenarios have also been proposed by orthodox astronomers.

ering a massive meteoroid stream, the Taurids. The event was sufficiently traumatic that religions were formed in essentially all cultures on the Earth. Thunderbolts were a prominent theme of the religions, but a new theme appeared—a ring surrounding the Earth. A possible mechanism for the ring formation was capture of small particles in the Earth's upper atmosphere coupled with later particle fragmentation."[1]

When it came to enumerating the mythic themes concerning this Earth-encircling ring, Mandelkehr zeroed in on those ancient texts referencing the cosmic ocean[2] which we, on the contrary, have interpreted as the circumstellar disk surrounding proto-Saturn.[3]

Transient ring systems around a primeval Earth are not, however, the unique domain of what some might call fringe theoreticians. Mainstream science has also considered the formation of such terrestrial bands. One such circlet, akin to that of Saturn, was in fact proposed by Immanuel Kant (1724-1804), a Biblical fundamentalist philosopher who has nevertheless been hailed as "one of the most important thinkers of modern times."[4]

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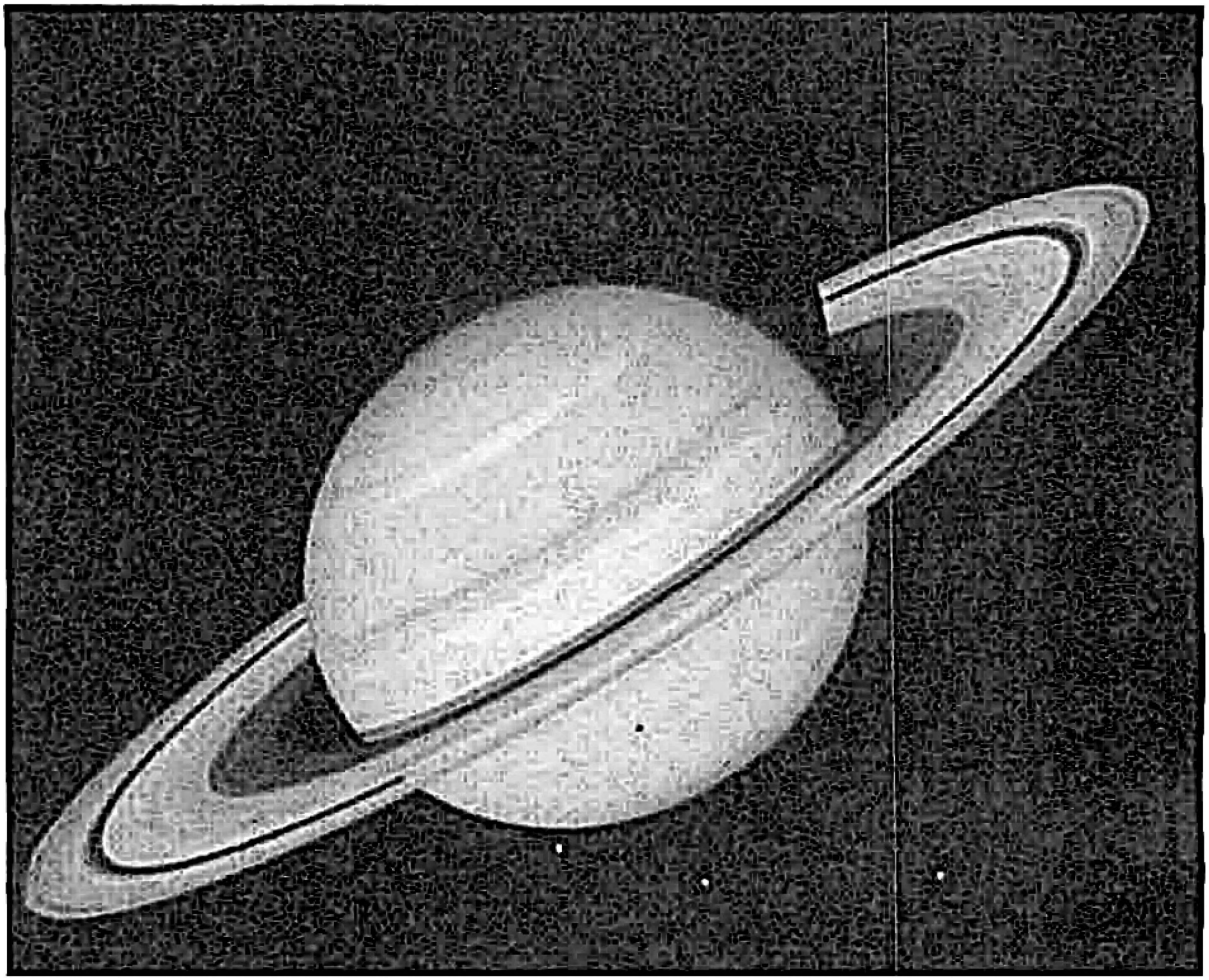
[1] M. Mandelkehr, "The Ring About the Earth at 2300 BC," *Chronology & Catastrophism Review* (2001:2), p. 8.

[2] *Ibid.*, pp. 9 ff.: see also *idem*, "The Stream Surrounding the Earth," *Chronology & Catastrophism Review* (2005), pp. 41 ff.; *idem*, "Waters, Mountains and Serpents Surrounding the Earth." *Chronology & Catastrophism Review* (2007), pp. 9 ff.

[3] *God Star*, pp. 261-270, 279-281; *Flare Star*, 217-226.

[4] W. H. Walsh, "Kant, Immanuel," *Encyclopaedia Britannica* (1959 edition), Vol. 13, p. 266.



The rings circling the planet Saturn to which theorized terrestrial ones are often compared. (Photograph courtesy of NASA.)

"A ring 'round the Earth! [he wrote] What a beautiful sight for those who were created to inhabit the Earth as a paradise! What a convenience for those on whom nature was designed to smile on all sides!"[1]

Kant believed that this ring is what was meant by "the waters which were above the firmament" mentioned in the Old Testament's story of the Creation.[2] He also thought this ring responsible for the Deluge of Noah, a belief that served as the impetus for similar ideas by latter-day Biblical fundamentalists, despite the disparagement he received from some of them on matters with which they did not wholly agree.[3]

[1] As quoted by C. Sagan & A. Druyan, *Comet* (N. Y., 1985), p. 78.
[2] *Genesis* I:7.
[3] See here, for example, D. W. Patten, *op. cit.*, pp. 34-36, 51, 52, 54, 58-60, 146, 148, 258, 261, 269.

"This ring [wrote Kant] undoubtedly consisted of watery vapors and besides the advantage which it might furnish to the first inhabitants of the Earth, it had further this property of being able to be broken up on occasion, if need were, to punish the world which had made itself unworthy of such beauty, with a Deluge."[1]

Much closer to our own time, in 1976, Hannes Alfvén and Gustaf Arrhenius also toyed with the same idea, although without resorting to any Biblical or other ancient textual evidence:

"The accumulation of matter close to the surface of the Earth [they wrote] is likely to have been rather similar to the inner Saturnian satellite group...A reasonable guess would be that the Earth should have formed about half a dozen satellites (and perhaps also a ring)."[2]

In 1980, as noted earlier in this very work, John O'Keefe revived the theory when he offered his opinion that a temporary ring system around Earth could have been formed from debris hurled into orbit, which would have produced a severe climatic event at the end of the Eocene. This Saturnian-like ring, according to him, would have been composed of tektites and other litter spewed into space by an erupting volcano on the Moon.[3]

O'Keefe's postulate was later picked up by Victor Clube and Bill Napier, but they suppressed all mention of the lunar volcano, giving the false impression that O'Keefe's "debris" was generated by heavy meteoric impact, thus bringing his hypothesis to conform with their own theory .[4]

That debris from an erupting lunar volcano can reach as far as Earth to circumscribe it with a ring system is no longer, if it ever was, considered scientifically viable. The hypothesis that debris could have been hurled into orbit from a drastic series of meteoric impacts on Earth, as per Clube and Napier, seems more sustainable. But that such debris could have congealed into a ring system around Earth, time and again, to produce the series of ice ages postulated by glaciologists throughout Earth's geological past seems less than probable.

A year later, in 1981, in an essay heavily burdened with Velikovskian overtones and sensationally illustrated by April Lawton, Lloyd Motz presented a doomsday scenario projected into the future. In describing the end of the Solar System, Motz predicted that, due to the "tremendous pull of the earth's tidal action," the Moon will fall apart and form "a ring of particles circling the earth."[5] Lawton's dramatic illustration of the event depicts "pieces of the shattered moon" as they "orbit the earth, forming rings much like Saturn's."[6]

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[1] C. Sagan & A. Druyan, *loc. cit.*

[2] H. Alfvén & G. Arrhenius, *Evolution of the Solar System* (Washington, D. C. , 1976), p. 455.

[3] J. A. O'Keefe, "The Terminal Eocene Event: Formation of a Ring System Around the Earth," *Nature* (285), pp. 309-311.

[4] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 113.

[5] L. Motz, "Earth: Final Chapters," *Science Digest* (August 1981), p. 84.

[6] *Ibid.*, p. 82.

In 1984, shifting the scene back to the past, two independent teams—one led by Al Cameron and Willie Benz, the other by Jay Melosh and Marlan Kipp—simulated terrestrial impacts on a large scale through the use of supercomputers and classified military computer programs. These simulations showed that a Mars-sized impactor would have blown away much of proto-Earth's mantle, exposing its iron core. The impactor itself would have merged with Earth and, while much of the ejected material would have fallen back to gravity's lure, a great quantity of it would have settled into "a thin ring, like Saturn's" around Earth. In time, this material would have aggregated "into individual moonlets" which would finally have coalesced to form the Moon.[1]

The following year, Richard Durisen presented a variation on the same theme. Keeping to a Mars-sized impactor, Durisen theorized that the impact would have taken place at a time when Earth was still in a molten state. The impact would have increased Earth's rotation, enabling it to fling some of its molten material into space to form a thick ring around it from which, eventually, the Moon would have been formed[2]—which theory continued to be preached into the twenty-first century.[3]

In 1989, in an effort to account for the discovery of lunar meteorites in Antarctica, it was theorized that such ejecta, which could have taken up to a million years to reach Earth, would probably have ended up forming "a temporary ring around [our globe], similar to Saturn's, but on a more modest scale, before eventually falling to Earth."[4]

By 1999, up to the end of 2002, Peter Fawcett and Mark Boslough had jumped on the band wagon after a few minor adjustments to its wheels. Their conveyance, however, remained just as wobbly. Yes, they claimed, Earth does seem to have once been surrounded by a ring and, perhaps, this transpired more than once. Their theory hearkens back to the impact which is believed to have killed off the dinosaurs. According to Fawcett and Boslough, the impact would have turned Earth into "the most beautiful planet in the solar system." This is because the "billions of tons of debris" lofted into orbit by the asteroid's violent contact would have left Earth "with a Saturn-like ring." This encircling band of rubble "would have taken about a hundred thousand years to form" but, "as the orbiting debris fell to Earth and burned up in the atmosphere, the ring would have disappeared." While it lasted, however, "it would have wreaked havoc with climate—and with whatever life survived the impact."[5] As they later added:

> "...changes in solar energy following the formation of rings could explain chaotic patterns documented in Earth's geological record. An equatorial debris ring, created by an asteroidal hit, could have reflected solar energy back to space before it was able to interact with the atmosphere."[6]

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[1] W. K. Hartmann, "Birth of the Moon," *Natural History* (November 1989), p. 75; R. Jayawardhana, "Deconstructing the Moon," *Astronomy* (September 1998), pp. 42-45.

[2] "Nuova Teoria Americana sull' Origine della Luna," *Corriere del Ticino* (October 23, 1985).

[3] See, for instance, K. Than, "Venus and Jupiter Helped Shape Moon's Orbit," *Space.com* (October 11, 2007).

[4] *New Scientist* (September 30, 1989), p. 30.

[5] "More of that Asteroid's Dark Legacy," *Discover* (April 1999), p. 20.

[6] J. Wilson, "Running Rings Around Earth," *Popular Mechanics* (December 2002), p. 26.

It can thus be seen that the idea of cosmic debris orbiting Earth in an encircling ring is neither unheard-of nor far-fetched. In fact, as it actually happens, Earth *is* surrounded by a filmy remnant of such a toroidal dust belt.[1]

With the possible exception of Hooker's scheme—re which see below—the biggest problem with all these theories is that, naturally enough, all those who, for whatever reason, have been led to posit such an orbiting cloud of debris have kept that cloud, or aggregation, compressed into an *equatorial* ring, often described by the proponents themselves as having been akin to the present Saturnian ones. And this, of course, is in keeping with presently-known mechanics as they pertain to tidal forces. The rings around the planets Saturn, Jupiter, and Uranus are prime examples of this force. And, in fact, this can also be demonstrated by the above mentioned, more recently discovered, toroidal dust belt that appears to be orbiting Earth at present since this belt does not envelope our globe within a spherical husk, but limits itself to a relatively thin toroidal ring in equatorial orbit. If ice or snow precipitated to Earth from such equatorial rings, it would have fallen precisely on those very areas which were actually destitute of glaciers, leaving the glaciated areas further north untouched. Needless to say, this is the very opposite of what transpired.

HOOKER'S CHILLING BELT

Among the foregoing theories, as far as this study is concerned, Hooker's 1958 hypothesis had appeared the most promising. In his endeavor to account for Earth's past ice ages, Hooker reversed the process conceived by previous glaciologists. Rather than seeing Earth's cooling climate as the cause for ice ages, he believed it were the ice ages themselves which chilled the climate. As with others before him and since, he came to this conclusion from a study of those temperate species of animals and plants the remains of which have been found entombed in ice in Earth's north polar regions. "Surely," he wrote, "the evidence indicates irrefutably that an avalanche of ice or snow suddenly descended upon and buried in an icy tomb a world teeming with temperate species of animal and vegetable life, luxuriating up to that very moment in a mild, benign climate, even within the polar circles!"[2] As already mentioned, and as far as our own scheme is concerned, he was, with others, mistaken in this, but only in misplacing this icy entombment in the sequence of events. But let that pass since, on its own, it does not invalidate his line of reasoning.

In following Hooker's rationale, one must nevertheless establish from where the "ice or snow" he speaks of would have fallen. And, yes, the answer is obviously "from the sky." But since that is where snow inevitably falls from, what was so different in his scheme? Since, according to him, it was not the cooling of Earth's climate that produced the "ice or snow," one must comprehend how this "ice or snow" emplaced itself in the sky to begin with. Not only that, but one must know what kept it there for long periods of time. Why did it not fall all at once, thus ensuring the occurrence of but one single ice age, rather than the series of ice ages that seems to be dictated by Earth's glacial record? To answer these questions, Hooker turned to the other planets of the Solar System:

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[1] F. F. Hall, "Solar System Studies," Part 2, *AEON* I:4 (July 1988), p. 22.

[2] D. E. Hooker, *Those Astounding Ice Ages* (N. Y., 1958), p. 50.

"Now what do we see when we look up at the other planets? We see Jupiter, Uranus, Neptune and Venus completely shrouded by enveloping cloud mantles. We see Saturn not only similarly shrouded, but also surrounded by a system of several discs or rings...These cloud covers, at least of Jupiter, Saturn and Uranus, are striated with latitudinal bands from their equators both ways to the poles. There are apparent rifts, gaps or divisions between the bands. The atmospheres in all cases are visibly rotating."[1]

When it came to Saturn's rings, Hooker reasoned that: "It would be illogical to assume that, of all planets, by some set of peculiar circumstances not common to other planets, Saturn alone developed a system of rings."[2] In this respect he proved entirely correct since rings were subsequently discovered circling around Jupiter, Uranus, and Neptune—although, like Vail, one would be hard put to find him credited for this correct prediction in astronomy text books.

Without going into too much detail, Hooker's theory then amounted to the following:

(1) Given the then current belief that Earth commenced on its career as an igneous globe, he contested earlier convictions concerning the origin of Earth's oceanic water. This led him to theorize that Earth's water, as well as various of its other constituents, would have vaporized to end suspended "in space above" in a dense "primordial atmosphere."[3]

(2) Since it is known that the atmospheres of the other planets rotate, it was logical for Hooker to claim that so, too, must have Earth's primordial atmosphere rotated.[4]

(3) As Earth cooled, a proportion of this atmosphere would have fallen back to Earth in the form of rain, from which the oceans, at first rather shallow, would have formed.[5]

(4) Through centrifugal or other forces, a proportion of this primordial atmosphere would have flattened itself into a ring, or system of rings, rotating around Earth's equator. "Hence reason would seem to justify us in concluding with considerable confidence that at some time in the past the Earth was surrounded by rings of matter just as is Saturn today."[6]

(5) Due to tidal drag, or some other force, or a combination of forces, the velocity of the ring, or system of rings, would have decreased with time.[7] Thus the rings, still according to him, would have split into two to gravitate poleward, north and south.[8]

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[1] *Ibid.*, p. 69.
[2] *Ibid.*, p. 76.
[3] *Ibid.*, p. 72.
[4] *Ibid.*, p. 73.
[5] *Ibid.*, p. 76.
[6] *Ibid.*
[7] *Ibid.*, p. 79.
[8] *Ibid.*, p. 80.

(6) In as much as the centrifugal force within the rings would have slowly decreased, gravitational attraction would have exerted its influence and the material within the rings would have fallen back to Earth "more largely toward the poles than toward the equator."[1]

(7) While Hooker deals with the fall of various substances from the ring, or system of rings, to Earth,[2] we concentrate on the fall of the rings' aqueous content. Hooker's reasoning here was that if a fall "happened to occur in winter in an area only thirty or forty degrees from the equator," it would very probably be in the form of ice or snow.[3]

What can be said for, or against, all this?

The notion that Earth's primitive atmosphere was denser than at present, which had already been proposed in the mid-nineteenth century by Richard Owen,[4] is in keeping with our own postulate.[5] Overall, however, although he does not mention him, Hooker's theory was merely an attempted refinement of Isaac Newton Vail's hypothesis. What drew me to consider Hooker's scheme, however, was his theorized splitting of the original equatorial ring, or system of rings, into separate bands that shifted north and south of the equator, since this would have canceled the objection I had raised concerning the equatorial orbit of the terrestrial rings proposed by others. As Hooker himself explained, this splitting and shifting of the ring, or system of rings, would have ensured precipitation on those very latitudes which we know to have been glaciated.

Minor details aside, two separate objections might immediately present themselves with Hooker's theory, both of which, as we shall later see, are somewhat deceptive. If, as he insisted, it was the accumulation of the fallen ice or snow that caused the climate to cool, it would mean that Earth and its atmosphere would have been warm to begin with. Such being the case, some might argue that the ice or snow that would have fallen from the rings should have melted as it descended through the warm atmosphere. Even if not, it might still be assumed that it would have melted once it reached the ground. Hooker, who was quite aware of this, stressed his belief that the precipitation would still have been frozen "despite the fact that latitudinal variations in climate were then less than at present and even polar climates were then mild."[6] And this, in turn, might be seen as constituting a *non sequitur*. To say the least, from Hooker's own point of view, it was. The real problem here is that Hooker did not take his hypothesis far enough.

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[1] *Ibid.*

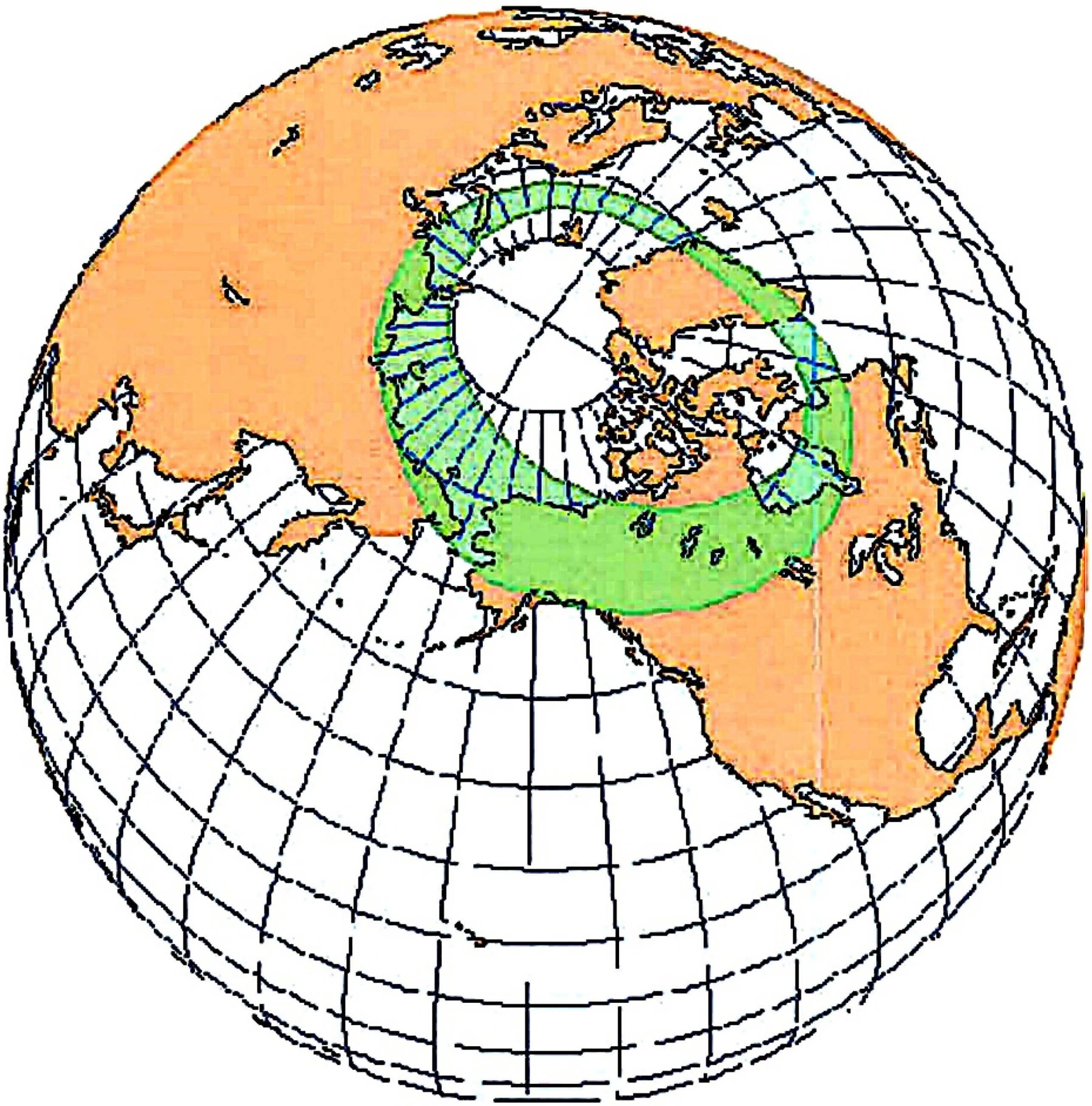
[2] *Ibid.*, pp. 80 ff.

[3] *Ibid.*, p. 86.

[4] D. Norman, *Dinosaur!* (N. Y., 1991), pp. 74, 218.

[5] *God Star*, pp. 346, 348, 380, 385; *Flare Star*, p. 331.

[6] D. E. Hooker, *loc. cit.*



The general area covered by the northern auroral zone (shown in green).
Compare to area covered by the Pleistocene Ice Age as shown on page 274.

The second problem is that tidal drag, centrifugal force, the coriolis effect, or a combination of these or other forces, have not managed to split the heavy atmospheres of the planets Saturn, Jupiter, or Venus, to send them gravitating poleward, north and south. It might at first seem rather difficult to find a mechanism that can accomplish such a neat atmospheric split. And while planetary rings do develop gaps, we do not see the individual ringlets of these planets shifting north and south of the equator. One might therefore argue that if Earth's original ring, as per Hooker, orbited Earth equatorially, it would either have remained equatorially anchored or, if low enough, it

The aurora borealis as seen from Earth.
(Photograph courtesy of NASA.)

might have dissipated over time to form a spherical shell around Earth.

And yet, when I first read Hooker's work, I could not help suspect that the truth would not be found to be far removed from his attempted postulate. When, decades later, the connection finally dawned on me, it was due to an insightful question asked by another.

THE TELL-TALE ZONE

That question was posed by my good friend Ken Moss while he was in my study looking at a diagram which superimposed the auroral zone on a map of Earth's northern hemisphere. "Is this not the same area which was covered by the glaciers during the Ice Age?" he asked. It wasn't quite, but it was close enough to make me think.

Now, to be sure, the aurora borealis can be seen in the sky anywhere from the top of the world all the way down to Mexico. In most of these latitudes, however, the aurora is visible

only rarely at infrequent times. As was discovered in 1860 by Elias Loomis, the aurora reaches its maximum at a latitude of about 65° from where it decreases in both frequency and intensity both north and south of it.[1] Succinctly phrased by Candace Savage, "the aurora spends most of its time around the ends of the earth, where it dances mainly for the pleasure of penguins and polar bears."[2]

> "Where the aurora is common, humans tend to be scarce. In the northern hemisphere, for example, the best places to view the lights lie within an auroral zone that encompasses such metropolitan centres as Barrow, Alaska; Yellowknife, La Ronge and Goose Bay, Canada; Tromsø, Norway; and Nordvik, Russia. Along this band, the lights can be seen on virtually every cloudless night from autumn to spring. (In the summer, the aurora is blotted out by round-the-clock sunlight.)"[3]

Below that zone, the aurora is seen less and less frequently in ever diminishing prominence the further south one travels. The map that Moss directed my attention to displayed those latitudes between which the northern aurora is *best* viewed throughout the year. And while the zone depicted there did not quite encompass the entire width of the terrestrial ribbon covered by the Ice Age, it was smack in the middle of it. Moreover, by stretching this zone slightly further north and south to include those regions from which the aurora is also visible just a little less regularly, it comes very close to those latitudes between which the Pleistocene Ice Age had maintained its boundaries—which is what Moss had intuitively noticed. But, as the reader might ask, what has the auroral zone to do with glaciation or the cause of ice ages?

[1] S.-I. Akasofu, *Aurora Borealis: The Amazing Northern Lights*, comprising Volume 6, Number 2, of *Alaska Geographic* (1979), p. 49.
[2] C. Savage, *Aurora: The Mysterious Northern Lights* (Toronto, 1995), p. 16.
[3] *Ibid.*

Chapter 10

Dusty Rings

THE AURORAS

For those who have never experienced them, auroras consist of fluctuating light manifestations seen against and/or below the sky in the extreme north- and south-encircling latitudes. These scintillating lights can take the form of diffuse patches or dancing streamers, bouncing arcs, shifting rays and, quite often, ephemeral hanging draperies which seem to sway in an unfelt wind. One of the most magnificent, if somewhat eerie, of natural phenomena, these lights can, and do, appear in varying shades of red, yellow, green, blue, and purple. The rapidity of their ever changing glittering behavior makes them a difficult subject to capture in still photography. Their life-like nature, however, could not but capture man's imagination. The Lapps feared and respected them as the fierce and powerful messengers of their god.[1]

> "The ethereal phenomenon of the Northern Lights had inspired centuries of myth and terror. In Norway they were sometimes called Blood Lights to recall the belief that they were the souls of dead warriors fighting, a portent of war and death. The Vikings thought that the magical apparitions were Valkyries, female messengers of the god Odin, riding from Valhalla to mark out those who would be killed in battle. The streaks of luminescence were their fiery spears, the flashing sparks the reflections from their shields, and the great arcs the mythical bridge, Bifrost, across which the souls of the dead passed to the next world."[2]

What transpired, in effect, was the transference of primordial mythic themes onto a much later celestial phenomenon which bore an uncanny resemblance to what ancestral memory had passed orally down through the ages.[3] In that respect it is not surprising that auroras and their light effects have even recently entered British catastrophist thinking in relation to the legend of King Arthur.[4] But let that pass.

In the meantime, primitive endeavors to explain what caused the lights proliferated.[5] "Trying to describe and explain the Northern Lights had taxed the world's greatest minds," wrote Lucy Jago, "their beauty and inconsistency snubbing even the most poetic and daring attempts."[6]

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[1] L. Jago, *The Northern Lights* (N. Y., 2001), p. 9.

[2] *Ibid.*, p. 10

[3] See here also H. Hirnschall, *The Song of Creation* (Vancouver, B. C., 1979), myth #35.

[4] J. Abery, "Society News," *Chronology & Catastrophism Review* (2004:3), p. 3.

[5] L. Jago, *op. cit.*, p. 11.

[6] *Ibid.*, p. 18

Ken Moss
(Photograph—2008—by A. J. Moss.)

Eventually it became quite evident that the aurora borealis, or northern lights, had a tendency to disrupt compass readings, a situation which had become something of a threat to navigation.[1] In 1740, Anders Celsius, the inventor of the centigrade scale named after him, had already interpreted the aurora as an electromagnetic phenomenon when he, too, repeatedly noticed that a big compass needle on his desk changed its orientation every time an aurora appeared in the sky above Uppsala, Sweden.[2] So did his brother-in-law, Olaf Peter Hiorter, who spent the entire year between 1741 and 1742 observing compass needles going awry at each appearance of the lights.[3]

I almost hate to mention it, but, in 1845, an uneducated girl in what has been claimed to have been a mesmeric trance offered answers to some questions concerning cosmology which, at this late date, seem quite uncanny. As it was recorded, one of these girl's comments stated that:

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[1] *Ibid.*, p. 23.

[2] H. O. G. Alfvén, "Cosmology in the Plasma Universe: An Introductory Exposition," *IEEE Transactions on Plasma Science* 18:1 (February 1990), p. 5.

[3] L. Jago, *loc. cit.*

"the magnetism of the earth is another modification of electricity, and also circulates through the system. It passes off from the Earth at the North Pole, producing the *Aurora Borealis*..."[1]

In 1861, Benjamin Marsh also "endeavored to show that an auroral streamer is a current of electricity which, originating in the upper portions of [the] atmosphere and following upward the magnetic curve which passes through its base" reaches "far beyond the supposed limits of the atmosphere..."[2]

And again in 1883, Selim Lemstron, a professor from Finland, reported the relationships he had presumed to exist between auroras and electrical activity. He accomplished this by artificially producing a "low-level aurora" that stretched to 400 feet above ground through a vast electrical apparatus he installed on top of a hill near Kultala, Finland. At the time, this was considered "the only known experiment that successfully reproduced the properties of the aurora on a large scale."[3]

Yet even so, electrical or otherwise, no one had yet managed to discover what it was that actually caused these scintillating lights.

"For nearly three hundred years [wrote Candace Savage] scientists had aspired to claim the auroral crown. One after another, earnest and worthy thinkers had struggled to unravel the riddle; one after another, they had failed. Then, in 1896, a new contender arrived on the scene."[4]

This new contender was the Norwegian Kristian Olaf Birkeland (1867-1917), whom we have had occasion to mention earlier in passing. From his base in Christiania, later renamed Oslo, Birkeland devoted a great portion of his life to an intensive investigation of the baffling aurora borealis. During this period of his life he mounted expeditions to remote icy regions, carting instruments and survival equipment up steep crags, setting up camps in the most dismal of weathers, in order to be able to study the phenomenon at first hand. Having been instructed in electromagnetism early in his career, it is not surprising that he, too, sought an electromagnetic solution to the creation of the auroras. In this he was additionally motivated by the work of William Crookes in England who had established that cathode rays in gas-discharge tubes can be deflected by a magnet. Birkeland therefore wondered whether electrons—which is what cathode rays really amount to—could be ejected by the Sun toward Earth. If such electrons could be captured by Earth's magnetic field, he reasoned, chances were they would be directed toward the poles. As these electrons flowed through the upper atmosphere, might they not even glow just as could be seen in laboratory discharge-tubes?

That was the kernel of Birkeland's theory, which was laughed out of court by just about every one of his scientific colleagues. One saving grace, which in the long run saved just

[1] "Truths from Humble Sources," *The Occult Magazine* (September 1885), p. 58.

[2] B. J. Marsh, "The Distinguishing Features of Comets Considered as Phases of an Electrical Discharge Resulting from Eccentricity of Orbit," *American Journal of Science* (May 1862).

[3] R. A. Ford, *Homemade Lightning* (N. Y., 2002), p. 171.

[4] C. Savage, *Aurora: The Mysterious Northern Lights* (Toronto, 1995), p. 90.

Kristian Birkeland

about nothing, was the acceptance of his theory by the English physicist Sydney Chapman. But even this did not last long. Having been warned by others that an electric current flowing from the Sun was an impossibility, Chapman ended up declaring Birkeland wrong in his assumptions. Even later, when Hannes Alfvén went out of his way in replicating Birkeland's terella experiments for him, Chapman refused to change his mind.[1]

Having spent the final days of his life in a study of the zodiacal light, some say Birkeland died of mercury poisoning inhaled during his long hours in laboratory experimentation. Most agree that he died, at the age of fifty, "broken in spirit and in intellect, disheartened by the harsh reaction to his theory."[2]

Forty-four years had to pass before Birkeland could be vindicated. It all started in 1961 when, on its way to the Moon, the Soviet Lunik 2 spacecraft encountered a stream of electric particles flowing from the Sun. But so reluctant were western scientists in accepting such evidence that they branded the Soviet data unreliable out of hand. The following year, however, the same stream of "electrified gas," traveling "at speeds ranging from 300 to 700 kilometers a second," was recorded by the instruments aboard NASA's Mariner II spacecraft while on its way to Venus. It was the first indication of what was later termed the "solar wind."[3]

Further evidence was collected in 1966 by a U.S. Navy navigation satellite which consistently recorded magnetic disturbances on almost every pass it made over Earth's polar regions.[4]

> "Since 1967 scientists have been looking at the satellite data in relation to phenomena such as the Northern Lights, rediscovering Birkeland's extraordinarily prophetic theories and completely reassessing his work. Today, he is credited as the first scientist to

[1] See here W. Thornhill & D. Talbott. *The Electric Universe* (Portland, 2002/2007), p. 33.
[2] C. Savage, *op. cit.*, p. 99.
[3] L. Jago, *op. cit.*, pp. 272-273.
[4] *Ibid.*, p. 273.

propose an essentially correct explanation of the aurora borealis, supported by theoretical, observational, and experimental evidence."[1]

The vertical currents that reach Earth through the interaction of the so-called solar wind were, in 1967, designated as "Birkeland currents" by Alex Dessler. As they have now become understood, Birkeland currents constitute helical plasmas that can be produced in laboratory experiments, but that can also stretch over vast distances in the immensity of space. Such a galactic Birkeland current recently discovered has been dubbed the Double Helix Nebula, which has unfortunately been described as a twisted magnetic flux tube. As Donald Scott has however indicated, it can "clearly be seen as a pair of helical current filaments in a plasma."[2]

As an additional posthumous compensation to Birkeland, a lunar crater has also been named after him.

Nevertheless, as Lucy Jago noted, "rejection of his theories probably slowed the advance of geomagnetic and auroral physics for nearly half a century."[3]

As we shall soon see, however, there was more to Birkeland's electromagnetic investigations.

THE TERRELLA EXPERIMENTS

To put it simply, a terrella—so named by William Gilbert in 1600—is a small artificial sphere constructed to simulate the terrestrial globe in laboratory experiments. Such terrellas have been experimented with since the late sixteenth century to investigate, as well as demonstrate, Earth's electromagnetic nature. Realizing that Earth is a massive magnet, Gilbert constructed small terrellas out of loadstones in order to illustrate the phenomenon. Sixty years later, Otto von Guericke constructed one from sulphur which acted to attract small particles, including dust, through static electricity. Terrella experiments then gathered momentum through the mid-nineteenth century when magnetic and electric phenomena became somewhat better understood. It is therefore understandable that, in his search for the aurora's secrets, Birkeland would also fabricate such a terrella. In fact he created more than one.

Each of Birkeland's terrellas, constructed consecutively throughout his experimental career, was suspended in a glass-lined vacuum-tank with brass plates for the top and bottom, which contraption acted as a gas-discharge chamber. Each terrella consisted of an electromagnetic coil inside a hollow brass, or sometimes aluminum, sphere. Earth's magnetic field could thus be simulated by energizing this coil. An electrode was then installed at one corner of the chamber through which gas discharges were initiated between it and the terrella's surface. In some cases Birkeland coated the exterior of these spheres with fluorescent paint in order to render small effects more readily visible. By varying the electrical input, and through different terrella models, he was able to recreate in miniature various sorts of atmospheric, solar, and

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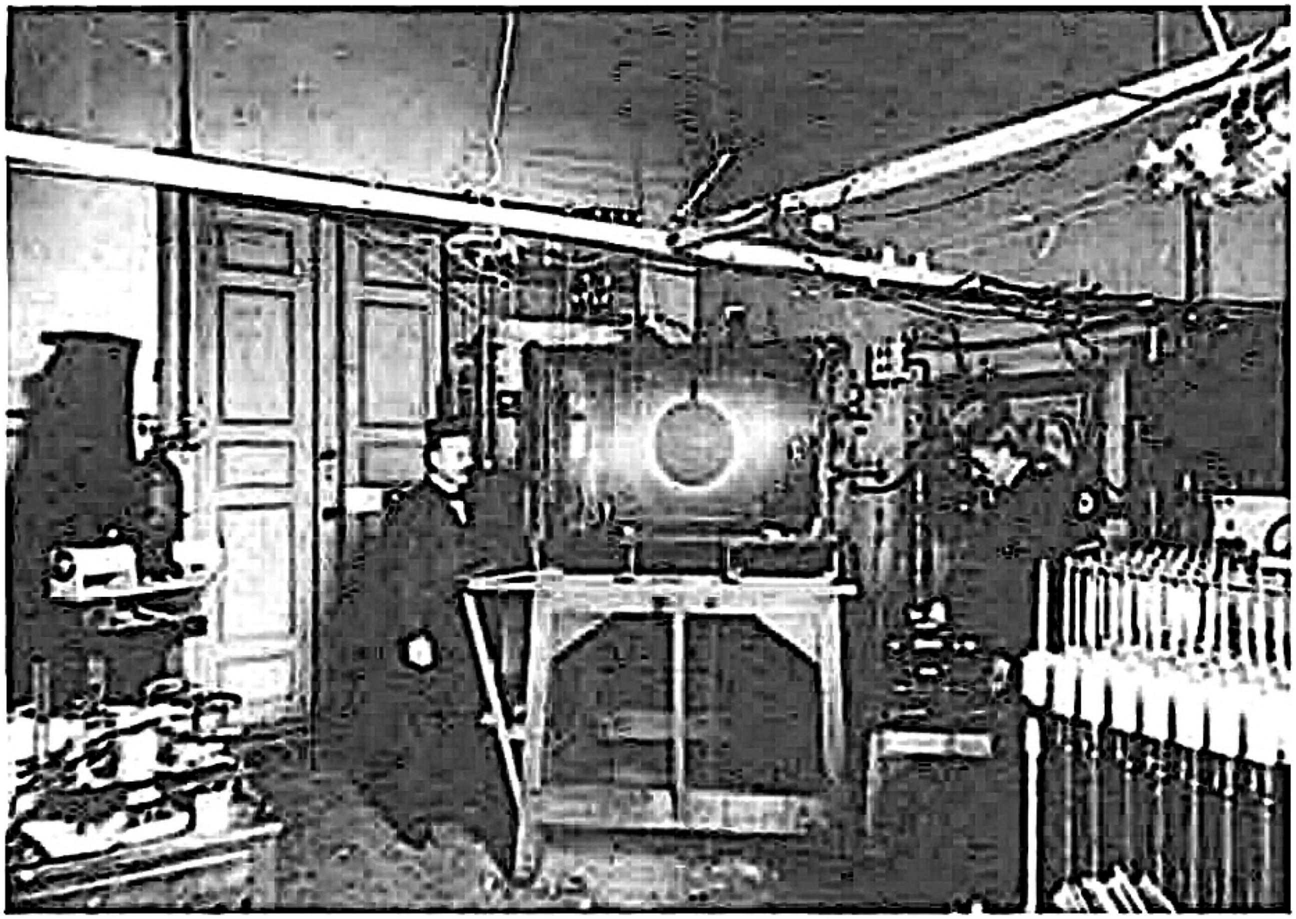
[1] *Ibid.*

[2] D. E. Scott, "Real Properties of Electromagnetic Fields and Plasma in the Cosmos," *IEEE Transactions on Plasma Science*, 35:4 (August 2007), p. 823.

[3] L. Jago, *op. cit.*, p. 276.

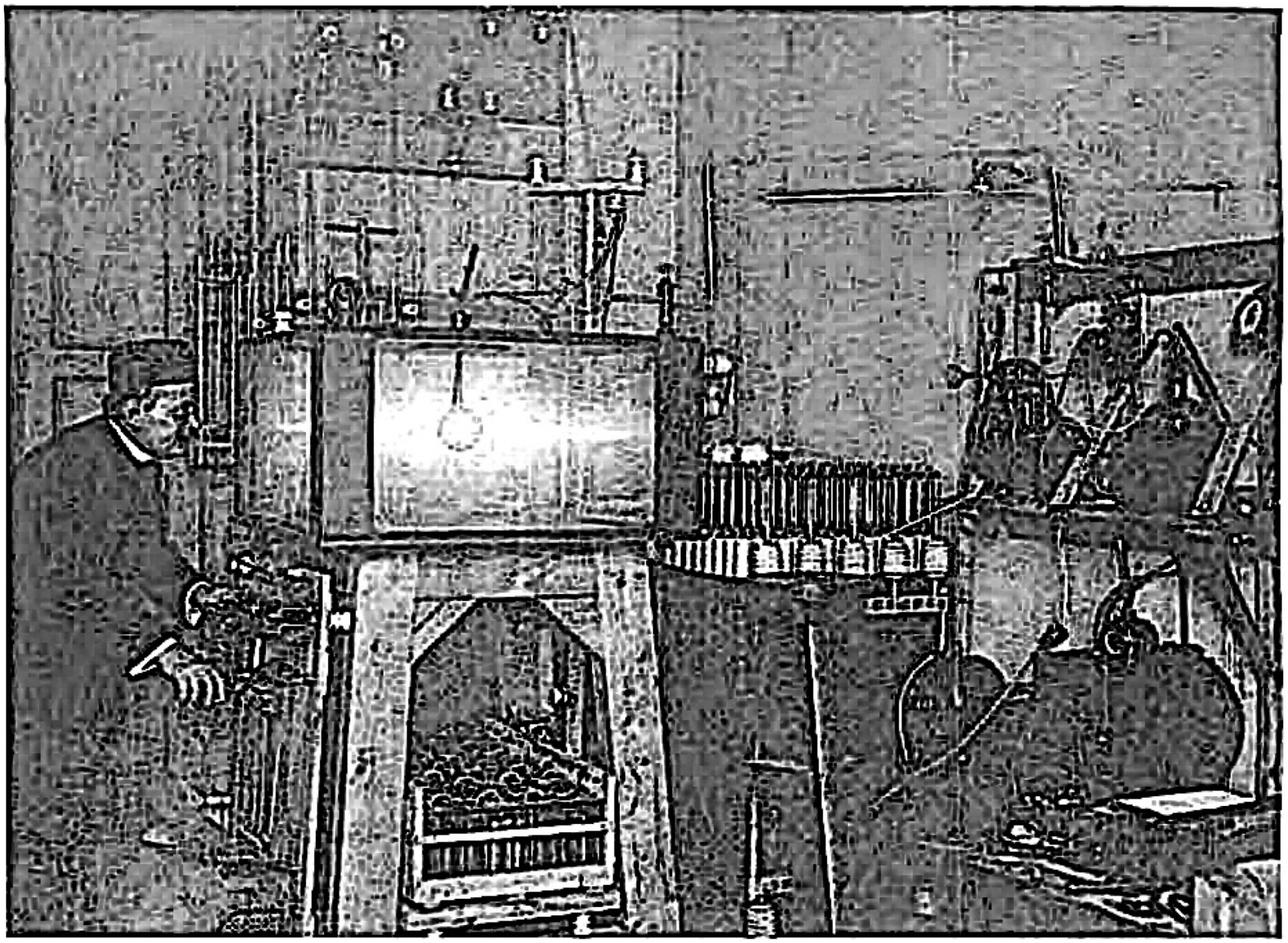
The Double Helix Nebula.
A sustained galactic Birkeland current clearly seen as a pair of helical current filaments in a plasma.
(Photograph courtesy of NASA.)



Birkeland (left) and assistant experimenting with the terella.

even planetary phenomena, such as the Sun's corona, sun spots that slid across the terrella's surface, the Zodiacal light, cometary tails, and even Saturn's ring.

Needless to say, however, Birkeland was mainly interested in recreating Earth's auroras. And his terrella experiments did not let him down. Under certain conditions, when the cathode was turned on, the electrons would stream in all directions. But once the electromagnetic coil in the terrella was also activated, the electrons found themselves trapped in the globe's magnetic field. A luminous band then formed equatorially around the sphere only to split into two individual rings which swiftly spiraled up and down to hug both poles. Thus, after all, Hooker's splitting of his proposed ring, which some might have seen as an impossibility, can be said to have had received prior experimental validity. Whether Hooker knew of Birkeland's terrella experiments or not remains a moot question, but he did not mention him in his work. Birkeland himself immediately identified these luminous pole-hugging toroids with the auroral zones. This, according to him, was exactly what transpires to form the auroral ovals around Earth's both polar regions. As with his general theory, these auroral rings were also thrown out of the scientific court, where they remained for long after Birkeland's death.



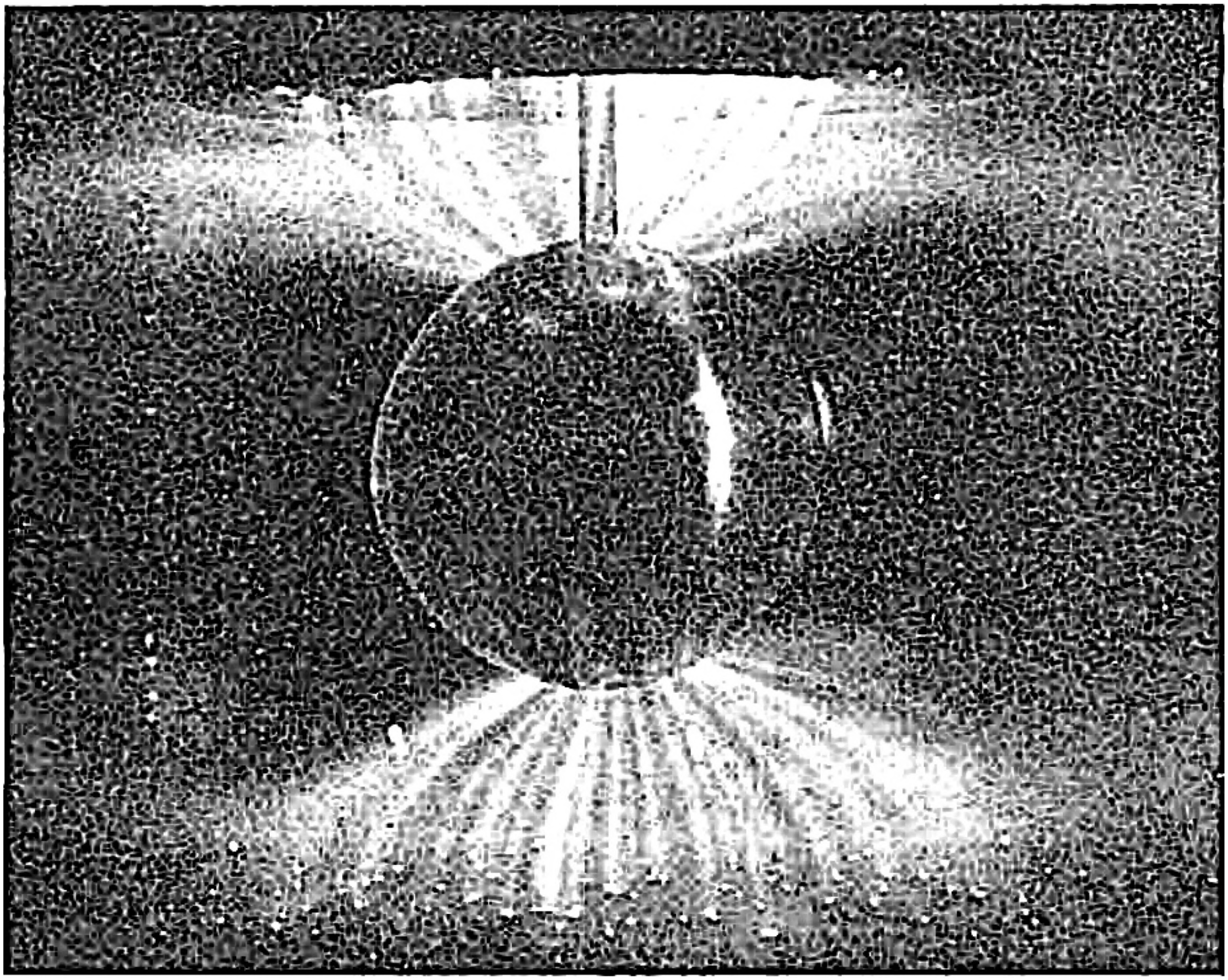
Birkeland and his terella.

THE AURORAL OVALS

The much celebrated International Geophysical Year, carried out during 1957-1958, extended over fifteen rather than the planned twelve months. Despite all the hoopla that preceded the event, Harry Hess did not have much faith in the ultimate outcome of this endeavor. "I take a rather gloomy view of IGY and doubt if anything of much interest will come of it," he wrote. "Fifty-six million dollars will produce a lot of scurrying back and forth to the South Pole and an indigestible mass of random observations on everything."[1]

Despite his scientific acuity, Hess certainly proved mistaken in this. Given the mechanical hardware and electronic instrumentation of the time, the IGY proved itself a stunning success, even though, as we shall see, some lessons that should have been learned fell by the wayside just the same. During that multinational effort set up in order to discover what can additionally be learned about Earth as a planet, scientists from various countries utilized a wide array of radio telescopes and instrument-laden rockets, some of which were borne aloft by balloons.

[1] I. Velikovsky, "H. H. Hess and My Memoranda," *Pensée* IVR II (Fall 1972), p. 26; *idem.*, *Stargazers and Gravediggers* (N. Y. 1983), pp. 324-325.



Auroral effects produced by Birkeland on the surface of one of his terellas.

The first Earth-circling satellites were also successfully launched by the United States and what was then Soviet Russia. What will be stressed about this concentrated enterprise in relation to our study, however, is the network of 114 special cameras which took photographs of the auroras in both the Arctic and Antarctic at one-minute intervals.

> "In addition, hundreds of amateur and professional observers made hourly reports of auroras seen across North America. As information from individual witnesses was laid beside that from their neighbours, a magnificent, large-scale picture was pieced together. One night the IGY Auroral Data Center reported 'a wall of light as long as the U.S. is wide, over 100 miles tall, with its bottom 60 miles from the ground, moving at 700 miles per hour'."[1]

On studying these IGY photographs in 1963, the Russian scientist Yasha Feldstein realized that this auroral "wall of light" had "likely" encircled Earth in the form of a ring at the

[1] C. Savage, *op. cit.*, p. 123.

time of its manifestation. But, much as in Birkeland's case, he, too, was "pooh-poohed by many of his scientific colleagues."[1]

As it also happened, the same lesson should have been learned just one year earlier, on July 9, 1962, when the United States detonated a 1.4 megaton thermonuclear device 400 kilometers above Johnston Island. As Anthony Peratt describes it, the event manifested a phenomenon that was recorded world-wide. The detonation ended up generating a plasma which formed two intense equatorial tubes, or toroids, akin to donuts, around Earth.[2] Said to have mimicked the Van Allen belts,[3] Earth had also imitated Birkeland's terrella, reproducing the same display that had been created in his Norwegian laboratory.

Although there were only a few who were willing to accept it, in the end it was found out that *that* is precisely the way in which Earth reacts to the solar flow of electrical particles in triggering auroras. Simply put, electrons and protons from the Sun become ionized and excited, causing them to glow, as they brush with Earth's atmosphere. Earth's magnetic field directs this activated glowing stream into its polar funnels where it concentrates itself into toroidal rings, or ovals, around both magnetic poles.

While maps on which the auroral rings were superimposed became quite popular, even these became redundant when, beginning in the 1970s, Earth-orbiting satellites, commencing with the Canadian ISIS-II, actually started photographing the auroral ovals. Such photographs are now quite common. There was no longer any dispute concerning the encircling of Earth's north and south poles by these toroidal plasmas. (Or should one say plasmatic toroids?) Birkeland's vindication was thus complete—although, thanks to the stubbornness of his contemporary peers, much good did it do *him*.

LAND OF ETERNAL SHADOW

What is therefore conceded is that the present auroral ovals, toroidal in cross section, are created by the terrestrial entrapment of the Sun's stream of charged particles through Earth's magnetic field. A similar stream of charged particles is here envisioned to have also been emitted by the sub-stellar proto-Saturnian sun in ages past. These charged particles would have been trapped by Earth's magnetic field in just the same manner as at present, with the formation of similar auroral ovals. And although proto-Saturn's stream of charged particles would have been somewhat weaker than that emanating from our present Sun, our posited primordial toroids would have actually been more energetic because of Earth's proximity to its sub-stellar host.

Additionally, and most importantly, that auroras are "a lovely example" of plasma is now universally accepted.[4] And as Anthony Peratt has stressed, plasma "is notorious for accreting

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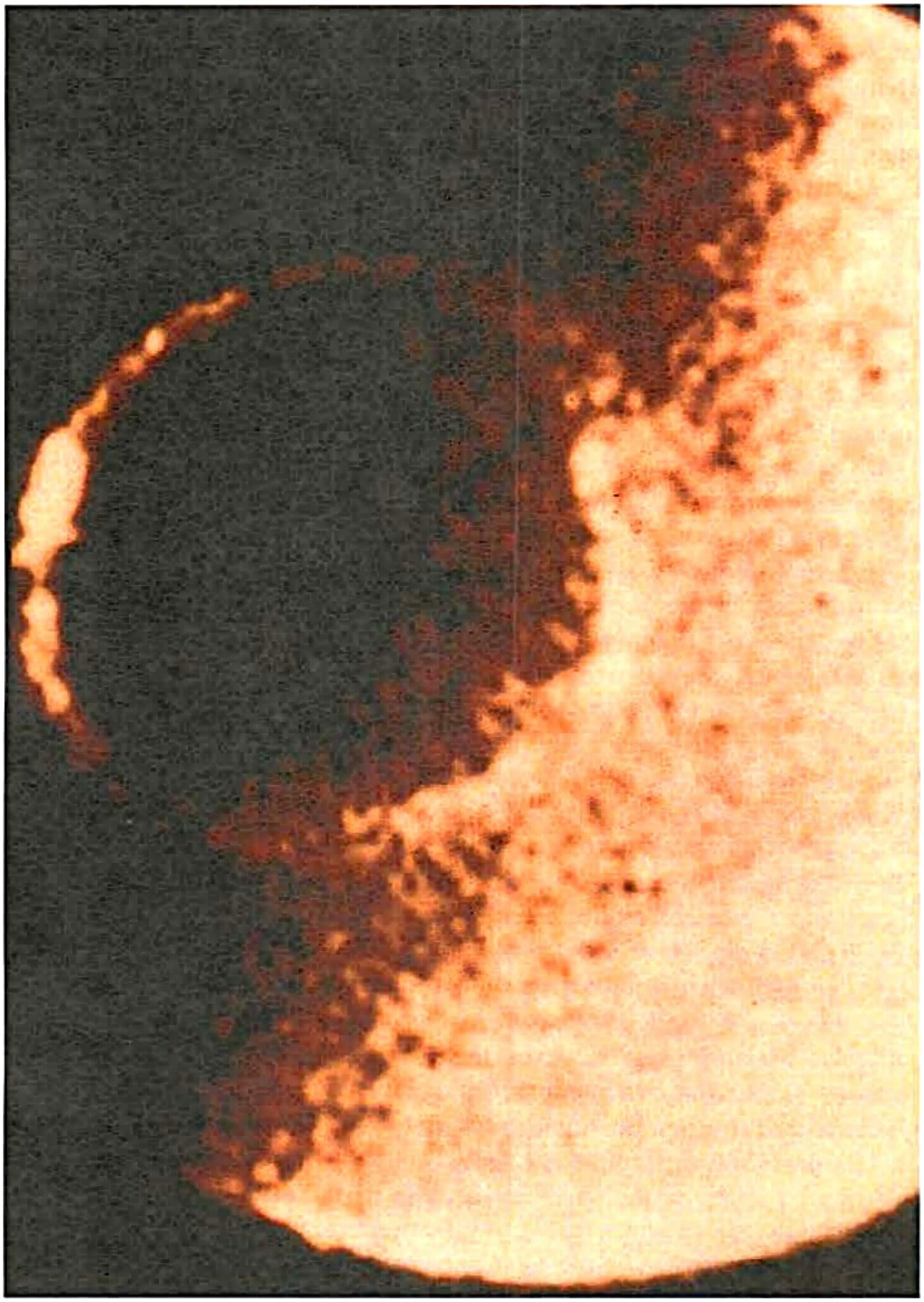
[1] *Ibid.*

[2] A. L. Peratt, "Characteristics for the Occurrence of a High-Current, Z-Pinch Aurora as Recorded in Antiquity," *IEEE Transactions of Plasma Science* 31:6 (December 6, 2003), p. 1192.

[3] *Ibid.*

[4] B. Hills, *Origins: Cosmology, Evolution & Creation* (Cambridge, 2003), p. 38; J. Achenbach, "The Fourth State of Matter," *National Geographic* (February 2006), "On Assignment" section.



The entire northern auroral oval as photographed from space on September 15, 1981, by special cameras aboard the Dynamics Explorer A satellite.
(Photograph courtesy of NASA.)

matter."[1] So, likewise, Hannes Alfvén who stated that:

> "Cosmic plasmas are very often 'dusty', by which we mean that they contain solid particles, some of which are very small dust grains. These are usually electrically charged, and if their charge to mass ratio is large enough their motion may be essentially controlled by electromagnetic forces so that they can be considered as part of a 'dusty plasma'."[2]

And, for the technically inclined, Alfvén went on with:

> "If a dusty plasma contains solid particles with an extended mass spectrum, there exists a limit, separating those grains which are small enough to be part of the plasma, and those which are big enough not to be strongly influenced by electromagnetic effects. The size limits depend on the magnetic field, the electric field, the gravitation, the charge and the mass density of a particle...When a particle enters a region of plasma with a large quantity of superthermal electrons it may suddenly increase its charge by a factor of 1000, which may result in the capture of the particle in the plasma. If later its charge goes back to a low value, and if it accretes enough mass in the plasma, its motion may again be determined essentially by non-electromagnetic forces."[3]

Furthermore, the particles that can be captured and contained within plasma can include sand, gravel, rock, and even ice.[4] As Alfvén noted, "*dusty plasmas* are very common in space."[5] And further that: "Dark interstellar clouds consist of dust plasmas..."[6]

Alfvén aside, the study of dusty plasmas, which is turning into a highly interdisciplinary field, is growing rapidly. It is now well known that the entire cosmos is laced with tiny specks of dust trapped in plasma. This dusty plasma has a tendency to both absorb and reflect heat as well as light. Thus, in an effort to understand how dust grains respond to conditions in space, researchers at NASA's Marshall Space Flight Centre built an apparatus in the Dusty Plasma Laboratory that is able to suspend individual dust grains, which are bombarded with radiation, in a near vacuum. The gas in this suspended cloud of dust, it was found out, displayed a tendency to heat up as it compresses. However, the dust grains in this cloud were found to radiate this heat as infrared light, *which then cools the cloud*, allowing for further collapse.[7]

A dusty plasma is fully demonstrated by the plasmatic torus that presently surrounds the planet Saturn.[8] Saturn's rings, the long tails of comets, and the spectacular clouds of nebulae

[1] A. L. Peratt on Intersect electronic discussion group sponsored by KRONIA Communication (June 16, 2004).

[2] H. Alfvén, *Cosmic Plasma* (London, 1981), pp. 92-93.

[3] *Ibid.*, p. 93.

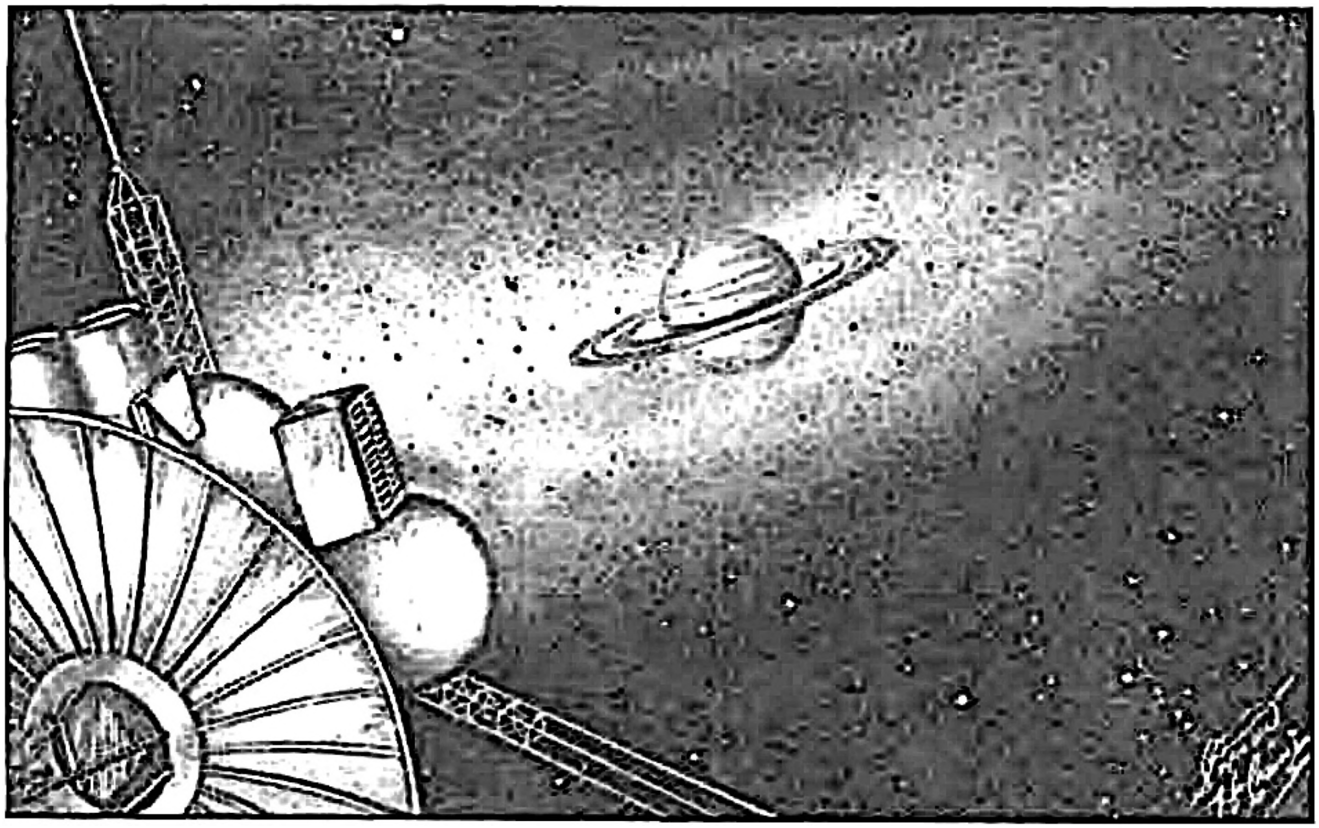
[4] W. H. Bostick, "What Laboratory-Produced Plasma Structures can Contribute to the Understanding of Cosmic Structures both Large and Small," *IEEE Transactions on Plasma Science* (December 1986), p. 710.

[5] *Ibid.* (emphasis as given).

[6] *Ibid.*

[7] P. Barry, "The Stuff Between the Stars," http://www.firstscience.com (June 7, 2006).

[8] M. R. Sharpe, "Space Exploration," *1983 Yearbook of Science and the Future* (Chicago, 1982), p. 383.



The debris-laden plasmatic torus surrounding the planet Saturn.
(Illustration courtesy of *Science Digest*.)

are now known to be crafted by the role dust plays in cosmic plasmas.[1] Even Saturn's famous radial features, commonly referred to as "spokes," which radiate across its rings, are now believed to owe their origin to microscopic dust grains,[2] although, as of this writing, this has yet to be verified. And even though, in like manner, the nature and origin of Saturn's present plasma doughnut continues to be debated, it is known to be laden with debris which is "attracted and shaped by the magnetic field, or magnetosphere, that surrounds Saturn."[3] Catherine Venturini, who has worked at the Dusty Plasma Laboratory, was forced to concede that "these little dust particles are playing a much more important role than we thought before."[4]

It can thus be argued that if enough material had accumulated in Earth's previous auroral rings, they would have ended up casting the atmosphere and land beneath them in eternal shadow as is exemplified by Saturn's present rings. Although estimates of the debris of which Saturn's rings are composed have been said to range "from the size of a grain of sand to that of a mountain,"[5] as it turned out "the rings may be even more vacuous than astronomers had

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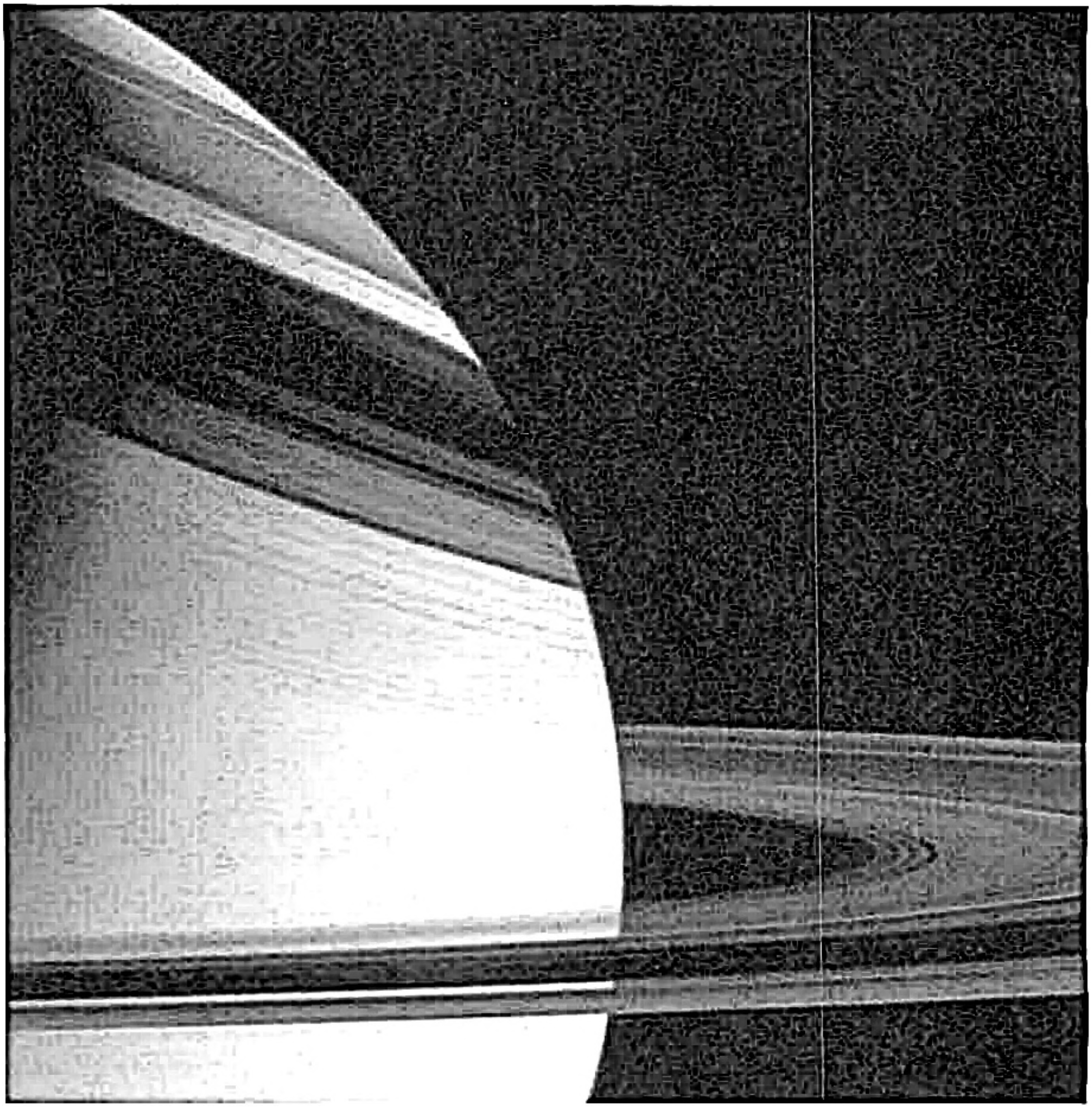
[1] P. Barry, *loc. cit.*

[2] *Ibid.*

[3] "Hot Gas Rings Saturn," *Science Digest* (April 1982), p. 20.

[4] P. Barry, *loc. cit.*

[5] D. Overbye, "Voyager Was On Target Again," *Discover* (April 1986), p. 81.



The distinct shadows cast by Saturn's rings.
(Photograph courtesy of NASA.)

guessed."[1] And yet, despite their relative translucency, through which stars are readily visible, the Saturnian rings still manage to throw a distinct shadow on the surface of the giant planet's clouds as any photograph of the planet taken from the right angle clearly shows.

It is here also conjectured that the amount of cosmic dust which burdened Earth's primordial auroral bands would have rendered them much denser than Saturn's present rings. They would not therefore have allowed proto-Saturn's light, or that bounced back by its

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[1] "A Jewel in the Crown," *Science Digest* (January 1990), p. 69.

encasing plasmasphere, to shine through. Loss of light would also have meant loss of heat. After all, light aside, proto-Saturn's radiated heat would itself have been impeded by the opacity of the toroids. Thus the Saturnian rings do not only throw their shadow on the planet's gaseous surface, they tend to cool the area on which they fall much more dramatically than had been expected.[1] But, more than that, as we have seen, infrared radiation tends to cool plasma clouds. In fact, the present inner magnetosphere of Saturn has been found to consist of dense cold plasma.[2] And do not brown dwarfs, which we claim the planet Saturn to have once been, tend to radiate in infrared?

But where would such debris have come from in the first place?

It is not that easy at this late date to calculate what amount of dust proto-Saturn's encasing plasmasphere would have contained within it. But a fair amount of the dusty particles it did contain would have ended up spiraling into the funnels of Earth's magnetic field at both poles to become part and parcel of its encircling toroids. But there is more than that.

That circumstellar disks contain a fair amount of dust had been formerly speculated,[3] and eventually ascertained through observation by the Spitzer Space Telescope.[4] Although this has led astronomers to assume that these particles are the result of disk collisions,[5] we see such dust as being integral to the plasmatic nature of the disks. This then leads us to surmise that proto-Saturn's circumstellar disk would also have contained a fair amount of dusty particles.

Astronomers, meanwhile, have themselves speculated that stellar radiation pressure would quickly blow such small grains out of their astral environment.[6] Compare now the force of stellar radiation to that of stellar flares. Would not the dust in proto-Saturn's circumstellar disk have been more easily blown away through the tremendous force emitted by its flare-up at the end of the Pleistocene? Is it reasonable to assume that the disk itself would have remained intact? Would it not, instead, have been blown away together with its dust? Not only that, but such, too, would have been the case in previous flare-ups.

But hold on, one might argue: If such a disk surrounded proto-Saturn during the Pleistocene, it could not have been blown away by a previous outburst. In fact that is precisely what we claim since more recent discoveries indicate that disks can reform following supernovae discharges. If supernovae remnants, like the Crab Nebula, can surround themselves with circumstellar clouds,[7] it can only mean that such clouds were created by the stellar explosions themselves, as became evident by the discharge of Supernova 1987A.[8] The disk would have

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[1] D. Hawksett, "Discovering Saturn," *Astronomy Now* (July 2006), p. 62.

[2] J. -E. Wahlund, *et al.* (Swedish Institute of Space Physics), "RPWS Cold Plasma Results from the Inner Magnetosphere of Saturn," http://www.space.irfu.se/seminars (May 11, 2006).

[3] T. P. Ray, "Fountains of Youth: Early Days in the Life of a Star," *Scientific American* (2004 Special Edition: "The Secret Lives of Stars"), p. 15.

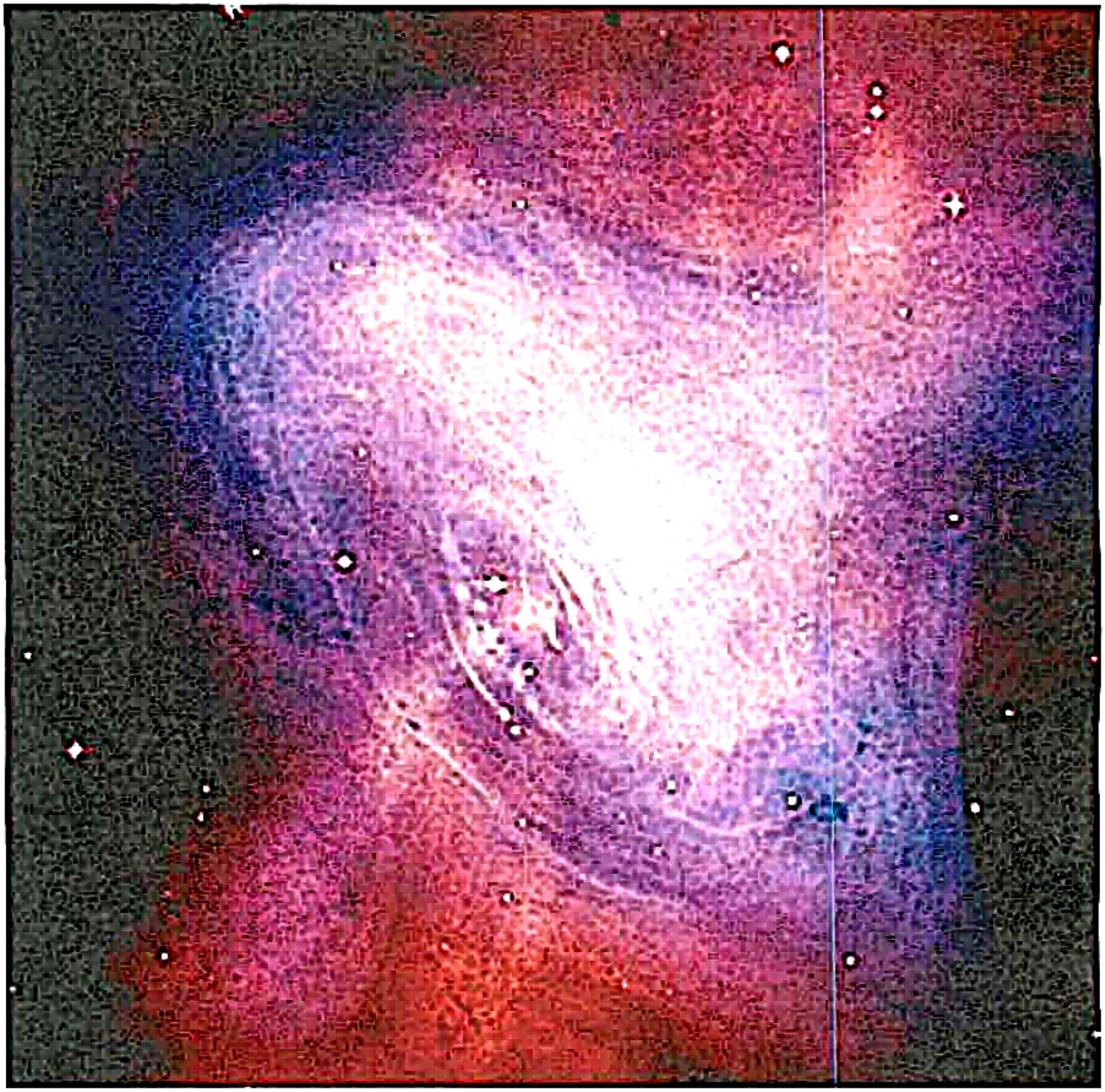
[4] D. Shiga, "Disk Demolition Derby," *Sky & Telescope* (April 2005), p. 24.

[5] *Ibid.*

[6] *Ibid.*

[7] See here, for instance, R. Zimmerman, "A Visit to the High-Energy Zoo," *Astronomy* (February 2005 Special Issue—"Explore the Universe"), p. 38

[8] *Ibid.*, p. 39; see also R. Naeye, "Supernovae are not Round, Continued," *Sky & Telescope* (May 2005), p. 22.



The circumstellar cloud surrounding the Crab Nebula—remnant of the supernova of 1054.
(Combined images from the Hubble Space Telescope and the Chandra X-Ray Observatory—courtesy of NASA.)

been reconstituted through the material proto-Saturn itself would have ejected during each of its flare-ups.

That stellar flares end up creating dust was confirmed while this book was being written. As it was announced in April of 2008, the Spitzer Space Telescope has enabled astronomers to ascertain that massive exploding stars are among the best dispensers of cosmic dust. The remnant of the Cassiopeia supernova alone has been calculated to contain enough dust the totaled mass of which could account for as much as 10,000 Earths.[1]

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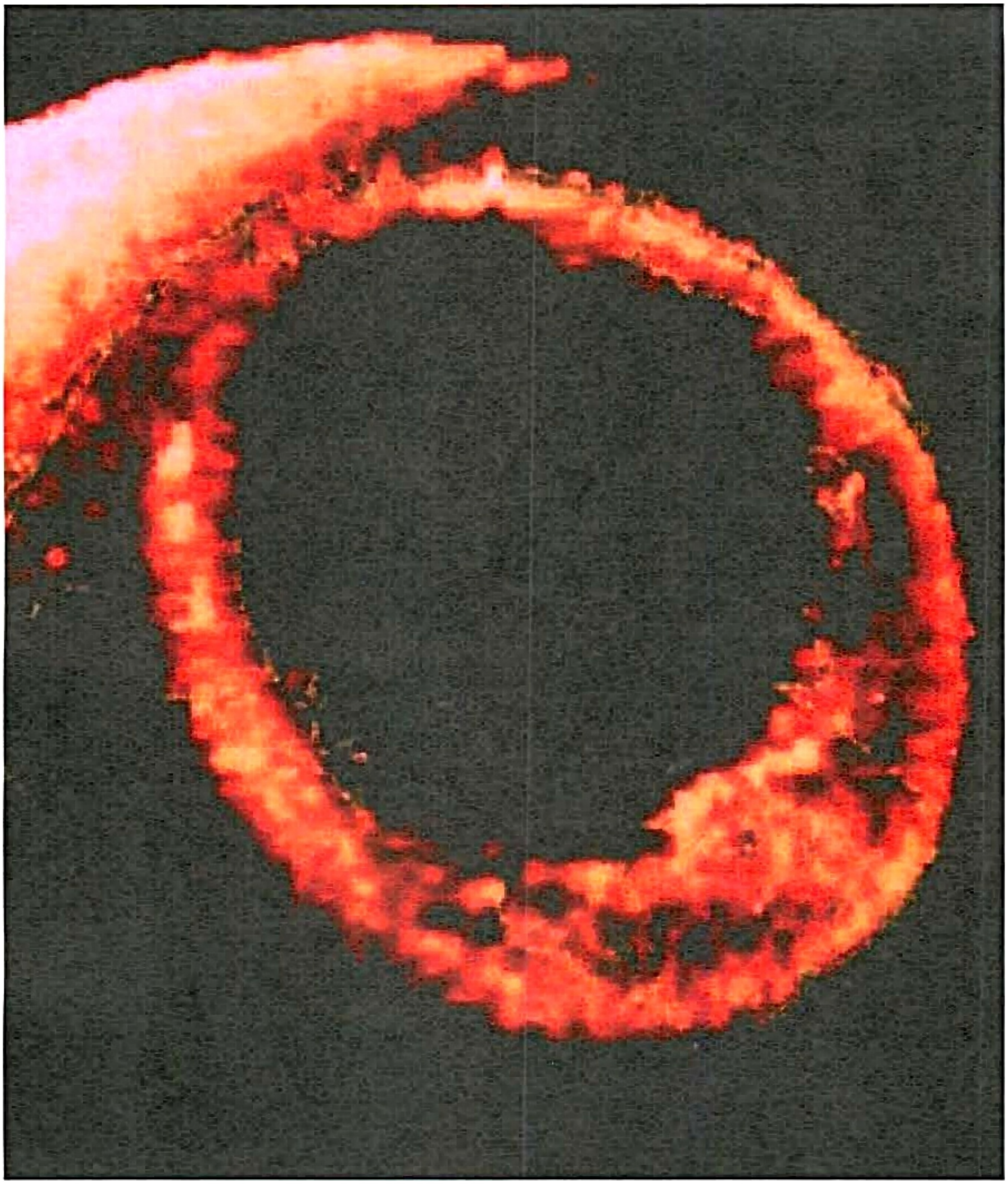
[1] L. Layton, "Supernovae Spawn Dust," *Astronomy* (April 2008), p. 26.



A more recent view of Earth's north auroral oval as seen from space. Illuminated crescent at top left corner constitutes reflected sunlight. (Photograph courtesy of NASA.)

It is therefore further concluded that every time proto-Saturn's circumstellar disk was explosively dissipated, its material would have been flung in all directions, but would probably have remained contained within its enveloping plasmasphere to mix with whatever dust proto-Saturn itself would have dispensed. Much of this material would therefore have remained within both proto-Saturn's and Earth's re-capturing distance.

Flare-ups would also have destroyed Earth's previous auroral ovals, which would then have taken time to reassemble themselves and so, also, to recapture some of the loose material they themselves had previously contained as well as some of that dissipated by the circumstellar disk.

A certain amount of dust would also have been contained within proto-Saturn's polar column and this, too, would have been released every time the column retracted prior to each flare-up.

Add up the amount of all this dust from each of proto-Saturn's successive flare-ups, and we end up with more than enough material for Earth's consecutive polar toroids to accumulate.

Whether each successive toroidal ring formed equatorially and then split to spiral north and south as per Birkeland's terrella experiment and Hooker's proposed scheme must temporarily remain a moot question.

If, as recently speculated, shooting stars can effect Earth's climate by leaving dust trails in our atmosphere,[1] it is not difficult to imagine what *permanent* dusty toroids around Earth's poles could accomplish in this respect.

In fact, dust falling into the Sun as the Solar System travels in and out of the Galaxy's spiral arms had already been proposed by such luminaries as Harlow Shapley, Fred Hoyle, and W. H. McCrea. According to the latter, the immensity of dust falling into the Sun would have caused the Sun to burn, relatively briefly, more brightly than before, which would then have caused the additional evaporation needed to feed glaciers.[2] But the same immensity of dust would also have fallen on Earth, clouding its atmosphere which would have shielded it from the Sun's increased heat.

Actually, never mind that. Just think of the great disparity between the sizes and masses involved—a calculated 333,000 Earths to equal the Sun's mass, while taking more than a million Earths to equal its volume.[3] If enough dust had fallen into the Sun to make it shine brighter, Earth should have been buried in it.

Atmospheric dust spewed up by volcanoes, as always, has also been held responsible for shielding the Sun's heat thus chilling Earth to the point of initiating ice ages.[4] But this method of chilling would have affected the entire Earth and not the selective ribbon of glaciated land we are here concerned with.

That dust did play a major role in causing past ice ages is more than evident since it was this dusty accumulation and associated material within the toroids that was ultimately respon-

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[1] *New Scientist* (August 27, 2005), pp. 14, 18.

[2] F. Warshofsky, *Doomsday: The Science of Catastrophe* (N. Y. 1977), pp. 179, 180.

[3] R. A. Gallant, *Our Universe* (Washington, D.C., 1980), p. 51,

[4] F. Warshofsky, *op. cit.*, p. 182.

sible for shading the atmosphere and the land below. These two sets of shadows would have been enough to cool the atmosphere through which they passed as well as the land beneath on which they fell. Through the thousands of years during which Earth's primordial set of toroidal rings lasted, these shadowed areas would have been chilled enough to produce our Earth-girdling ribbon of ice—at least in the northern hemisphere.

DISPARITIES RESOLVED

Those in the know will already have been shaking their head at the above since it is well known that auroras actually heat, rather than cool, the atmosphere. At present, the very stream of charged particles from the Sun that is responsible for the auroral lights also cause the ionization and heating of the ambient atmosphere. In fact, the change in temperature and the rise in winds this heat creates can be quite pronounced. Temperature can rise tenfold and the created gales can blow at more than one thousand miles per hour. All of these disturbances, however, limit themselves to the atmosphere *above* the auroral ovals. With the present ovals reaching up to 60 miles above the land, the turbulence in question can achieve double that height. None of these instabilities ever reach down to where Earth's weather really takes place.

That the atmosphere beneath the toroids would have been anything but warm is additionally evidenced by noctilucent—i.e., night-shining—clouds which form at an altitude of around 50 miles. The actual manner of their formation has never been determined. What *is* known about them is that they usually form near the poles and drift toward the tropics. In their migration, they tend to float in the mesosphere well above the regime of normal clouds, but below the auroral ovals with which we are concerned. And while, as we have seen, the atmosphere above the toroids can be relatively hot, the temperature of the air beneath the clouds in question can reach as low as -225 degrees Fahrenheit (-143 degrees Celcius). This is enough to freeze the particles of dust which act as the seeds from which these clouds are formed. The dust itself has been hypothesized to be cosmic in origin—which does not surprise us—perhaps even the debris from burned-up meteors. And while it has not yet been discovered why, this air is colder in summer than it is in winter.[1]

It can thus be seen that the atmosphere beneath auroral ovals can actually be much colder than that above the ovals, cold enough to freeze whatever moisture can gather on air-borne nanometric dust motes. But that is under *present* conditions. What would happen to such a freezing atmosphere if it was additionally constrained within a perpetual shadow created by dust-laden toroids? Would not the shadowed areas have been gripped in an even more relentless cooling spell? And since this would have lasted for untold ages, would not those shadowed areas have been frozen for just as long?

There is no point in claiming that reflected light from proto-Saturn's plasmasphere would have slid past *underneath* the toroids to cancel the shadows they would have created. Such beams would have been too slanted and too weak to neutralize the umbrae created from overhead by the direct rays from the proto-Saturnian sun, as a scaled-down experiment will readily show.

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[1] *Scientific American* [Internet] *News* (July 10, 2007).

Light aside, one might argue that the 60 mile separation of the auroral ovals from the ground would leave enough room for warmer air from elsewhere to move in and ameliorate the cooling within the canopied shadow of our proposed toroids. But even if we were to ignore what we have already documented, a moment's reflection should remind the reader that air currents sweeping in from warmer areas do not improve the present freezing conditions in the Arctic and Antarctic.

True enough, as Frederic Jueneman pointed out, warmer winds *do* ameliorate present polar conditions,[1] but even in 5,000 years of such amelioration, these warmer winds have not yet managed to do away with all the accumulated ice in these respective areas.

One of several advantages that our hypothesis includes is that the rest of Earth would have remained warm enough to allow for the required evaporation of water from its oceans. The condensation this led to would have precipitated on various lands outside the toroidal shadows, showering them with heavy downpours of warm rain. That this actually transpired has been known for quite some time.

"During the glacial epochs," wrote Robert Silverberg, "such regions as Africa, South America, central Asia and the southern United States experienced periods of greatly increased rainfall."[2]

> "A series of pluvial and interpluvial periods, almost exactly corresponding to the glacials and interglacials of colder latitudes, has been determined [Silverberg goes on]. During these prolonged rainy spells, lakes and rivers grew, basins now dry filled with water and deserts bloomed. Nevada contained more water than Minnesota; a vanished pluvial lake we call Lake Lahontan covered the northwestern part of the state...There were lakes in the Sahara; rainfall was heavy in Africa's Kalahari Desert and Asia's Gobi [Desert]."[3]

Even at present, auroral displays remain intimately associated with wet weather. In the late 1860s, auroras seem to have taken leave of Earth, with summers so dry that crops were ruined. But then, in 1870 and 1882, the boreal ovals returned and summers turned much wetter than usual.[4]

Once similar circulating moisture-laden air trespassed into the toroids' shadows back in Earth's primordial times, it would have easily crystallized to precipitate as snow and ice on those areas directly below where it would accumulate and compact into spreading glacial sheets. Our season-less scheme has no need of Hooker's postulated winter for the freezing of this precipitation.

Needless to repeat, the Arctic region would have remained ice-free since not only was it outside the shadowed area, it would also have continued to receive the full impact of proto-Saturn's direct rays.

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[1] F. B. Jueneman to D. Cardona, private e-mail communication (August 6, 2008).

[2] R. Silverberg, *Clocks for the Ages* (N. Y., 1971), p. 94.

[3] *Ibid.*, pp. 94-95.

[4] *Transactions and Proceedings of the Royal Society of New Zealand 1868-1961*, Vol. 27 (1894), p. 659.

The demarcation between our posited shadowed areas and those on which both heat and light bestowed their blessing would not have been anywhere close to being abrupt. A shadow can only have clean edges if the object that casts it is close enough to where the shadow falls. The demarcation of Earth's toroidal shadows would have diffused progressively through these hazy intermediate areas from cold to warm (or vice versa if you wish). But also, as shadows do, those from the toroids would, with their penumbrae, have fanned out through the atmosphere to cover a wider area of land, north and south, than the width of the toroids themselves.

The present auroral ovals have a tendency to wobble around Earth's magnetic poles, expand in width, and move to lower latitudes through the effects of intense solar storms. Thus, for instance, during the geomagnetic storm of February 11, 1958, the width of Earth's northern auroral oval expanded tremendously as it shifted below the United States-Canadian border.[1] This is not to be wondered at since everything in nature, from planets and their satellites to the most distant galaxies, is prone to periodic fluctuations—which is why it is so difficult to predict weather, earthquakes, solar storms, and various other phenomena. It is not then to be expected that brown dwarfs and sub-brown dwarfs would act any different and, as we have seen, they are just as prone to outbursts. Nor must it be assumed that these discharges would always have been on the scale of our postulated series of flare-ups. Flares from brown dwarfs are now known to come in varying intensities. What *can* be assumed is that Earth's primordial auroral rings would have been subject to similar storms emanating from the proto-Saturnian sun. This would have been especially so during each of its successive flare-ups, but there would also probably have been lesser eruptions from time to time as the proto-Saturnian system traveled through space. At present, auroral oval expansions and displacements due to solar storms do not last long. It cannot, however, be taken for granted that neither would they have lasted long in primeval times. With an Earth immersed in an electric environment that was much more dynamic than at present, it is not beyond possibility that these fluctuations would have lasted longer in primeval times. But exactly what effect they would have had on the terrestrial terrain has still to be evaluated.

Would the auroral rings have been visible as such to ancient man? Is there anything in the mytho-historical record that hints of such Earth-circling rings? The southern toroid, concentrated solely on Antarctica, would definitely have gone unnoticed since, until modern times, no humans had inhabited that continent.

But what of the northern one, outside the shadow of which man would have congregated both north and south of its extremity? Some might point to that little-known Jewish legend according to which God brought ten separate items into being on the first day of Creation. One of these was Tohu which is described as "a green band which encompasses the whole world."[2] Others might draw attention to an even lesser known Jewish tract which describes Leviathan as a serpent encircling the world.[3] But tempting as these legends might seem, we

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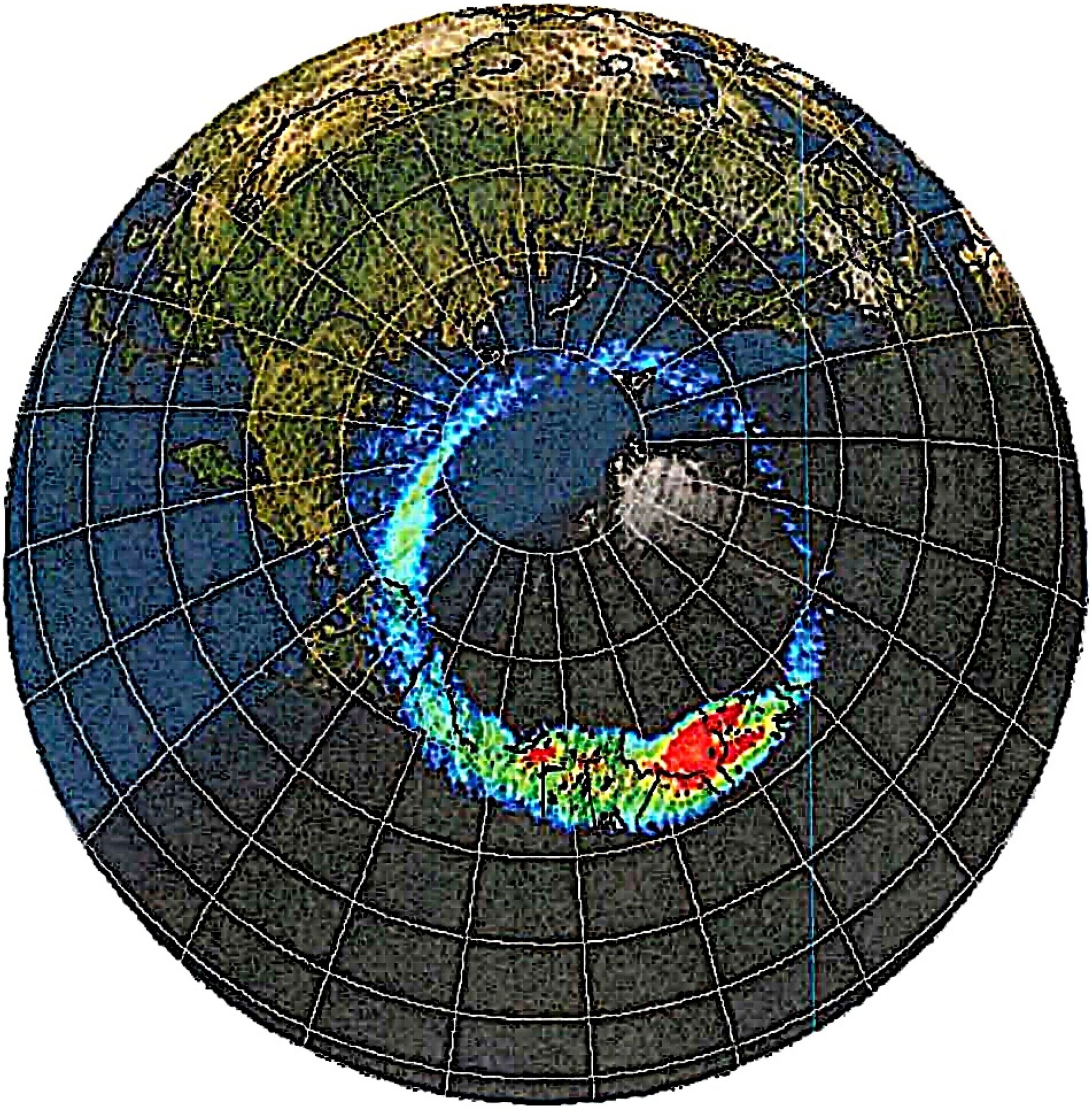
[1] S.-I. Akasofu, *Aurora Borealis: The Amazing Northern Lights*, comprising Volume 6, Number 2, of *Alaska Geographic* (1979), p. 86

[2] L. Ginzberg, *The Legends of the Jews*, Vol. I (Philadelphia, 1968), p. 8. (But see also *God Star*, pp. 261-262.)

[3] *Ibid.*, Vol. V, pp. 45, 46.



The northern auroral oval superimposed on the terrestrial globe.
Compare the area covered to that shown on page 284.

will be showing in a future volume that they both pertain to a different, even if related, celestial apparition. Besides, a moment's reflection should indicate that there is nowhere on Earth from which such toroidal rings can be seen in their entirety which is why it took so long to recognize their oval shape.

One could then argue that, at best, all that could have been seen is a portion of the ring arcing across the sky from one horizon to another, which is more or less what April Lawton

showed in illustrating the debris of the future shattered Moon as theorized by Lloyd Motz.[1] And here, perhaps, the Germanic myth which tells of Bifrost, that immense bridge which spanned the sky, connecting Earth to heaven,[2] might come to mind. In Lawton's case, however, what she depicted was an equatorial ring around Earth far out in space. Auroral ovals, 60 miles above the land, are anything but that far out. When their width, plus their diffuse termini, are considered, it is doubtful that such arcs spanning the sky could have been seen. Besides, an arc that spans the sky from one horizon to another can only be said to join Earth to Earth, and not Earth to heaven, and so Bifrost must also be ruled out (although, like Tohu and Leviathan, we will be considering it in a following volume of this series).

The only sign the toroids would have imprinted on heaven above as viewed from Earth would have been a gradual misting of the atmosphere at the rings' diffused periphery, which would have progressively darkened into a swath of overcast sky against the backdrop of the much more distant circumstellar disk. Additional to that, auroral manifestations would also have scintillated across the sky. No one in Earth's northern hemisphere would have realized that this constituted a pole-circling toroidal ring.

The reconstitution of the auroral ovals, their accumulation of dust and other material, the chilling of the air and land within and underneath the shadowed areas they gave rise to, the slow precipitation of snow within those shadowed areas, and the accretion of the glaciers in the land below, did not take place suddenly—no matter how one may define "suddenly." The mind staggers when one reads that "17 million cubic miles of the world's water transformed into ice,"[3] and that "about one third of the earth's surface was buried under ice that averaged a mile in thickness."[4] Nor will it do to argue, as some have, that these statistics are nothing but educated guesses, or, as others have maintained, that they have been highly exaggerated. One is still left with a staggering amount of evidence which duly points to a protracted, as opposed to a sudden, onslaught of ice. In this respect, even the word "onslaught" is inapplicable.

Another important aspect of the theory propounded here concerns the manner in which the ice advanced and then retreated. Under all presently proposed schemes—and we have seen there are enough of them[5]—in which the Sun is ultimately held responsible for ice ages, freezing should have progressed from north to south. Glacial evidence from the Pleistocene, however, indicates that this was not the case. The direction of flow proves that the ice radiated in deviant trajectories from different focal points.[6] Although we disagree with Charles Hapgood concerning the tilting of Earth's axis to account for ice ages, he did correctly note that the ice "did not start in a small area and expand outward, but rather it started all at once over a great area."[7] So, similarly, when the ice melted at the end of the Pleistocene, it "did not melt from south to north, as might have been expected," Hapgood additionally noted, "but from all

[1] L. Motz, "Earth: Final Chapters," *Science Digest* (August 1981), p. 82.

[2] P. Grappin, "Germanic Lands: The Mortal Gods," *Larousse World Mythology* (London, 1972), p. 363.

[3] W. Chorlton, *Ice Ages* (Alexandria, Virginia, 1983), p. 20.

[4] *Ibid.*, p. 24.

[5] See especially *Flare Star*, Part One in its entirety.

[6] R. F. Flint & M. M. Leighton, "Glacial Epoch," *Encyclopaedia Britannica* (1959 edition), Vol. 10, pp. 374-375; S. W. Carey, *Theories of the Earth and Universe* (Stanford, California, 1989), p. 66.

[7] C. H. Hapgood, *The Path of the Pole* (N. Y., 1970), p. 162.

sides toward the central area, about Hudson Bay."[1] But this was only part of the story. Out of the Canadian shield the ice retreated very much in the opposite manner in which it had accumulated, toward different loci. All of which is in keeping with our scheme in which the consequent precipitation would have fallen on the entire shadowed areas simultaneously, with glaciers forming on high ground from which they pushed relentlessly in various radiating patterns. So, similarly, once proto-Saturn flared up, the sudden heat it released would have tended to melt the glaciers in reverse order to which they had accumulated. They would have retreated in ever decreasing peripheries around the modest heights from which they would have originally radiated.

But what, then, of ice ages in the tropics?

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[1] *Ibid.*, p. 143.

Chapter 11

Earth's Southern Pole

TROPICAL GLACIERS

It has been claimed that even "the tropics felt the effects of the global chill" during the Pleistocene and that "glaciers formed on Mauna Kea and Mauna Loa in Hawaii and Mount Elgon in Uganda—mountains that are today ice-free."[1]

We have also seen that animal remains at Meadowcroft Rockshelter in Pennsylvania, just beyond the demarcation of the northern glaciation, indicate "a warm climate rather than the icy conditions" that should have gripped this area during the same epoch.[2] As also noted previously, "tropical seas weathered the glacial epoch with remarkable stability, hardly cooling it at all."[3]

So what is the truth?

To begin with, glaciated mountains of themselves do not constitute an ice age. And tropical glaciers seem only to have formed on high ground, such as the presently ice-free mountains mentioned above. On others, such as Mount Kilimanjaro in Tanzania, glaciers remain to the present—but at a higher altitude than the glaciated slopes that remain evident lower down[4]—although even these are presently melting at a drastic rate.[5] Some of these glaciers even existed on the equator.[6] Those high enough still do.

But then glacial motion, too, is known to fluctuate. Thus, for instance, it has been known since 1879 that Alaska's glaciers are retreating,[7] as so also elsewhere in the world.[8] On the other hand, some are still advancing, both in Alaska[9] and elsewhere.[10] What this means, as Richard Lovett noted, is that "a warming climate is not necessarily synonymous with glacial retreat."[11] Neither is it necessarily reliant on solar radiation. According to solar physicists: "Since 2000 less sunlight has been reaching the Earth's surface," but "paradoxically this drop

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[1] W. Chorlton, *Ice Ages* (Alexandria, Virginia, 1983), p. 24; see also D. S. Allan & J. B. Delair, *Cataclysm!* (Santa Fe, New Mexico, 1997), p. 340.

[2] P. James & N. Thorpe, *Ancient Mysteries* (N. Y., 2001), p. 356.

[3] R. Monastersky, "Coral's Chilling Tale: Ancient Reefs May Resolve an Ice Age Paradox," *Science News* (February 19, 1994).

[4] D. S. Allan & J. B. Delair, *op. cit.*, p. 315.

[5] P. W. Mote & G. Kaser, "The Shrinking Glaciers of Kilimanjaro: Can Global Warming be Blamed?" *American Scientist* (July-August 2007), pp. 318 ff.

[6] D. S. Allan & J. B. Delair, *loc. cit.*

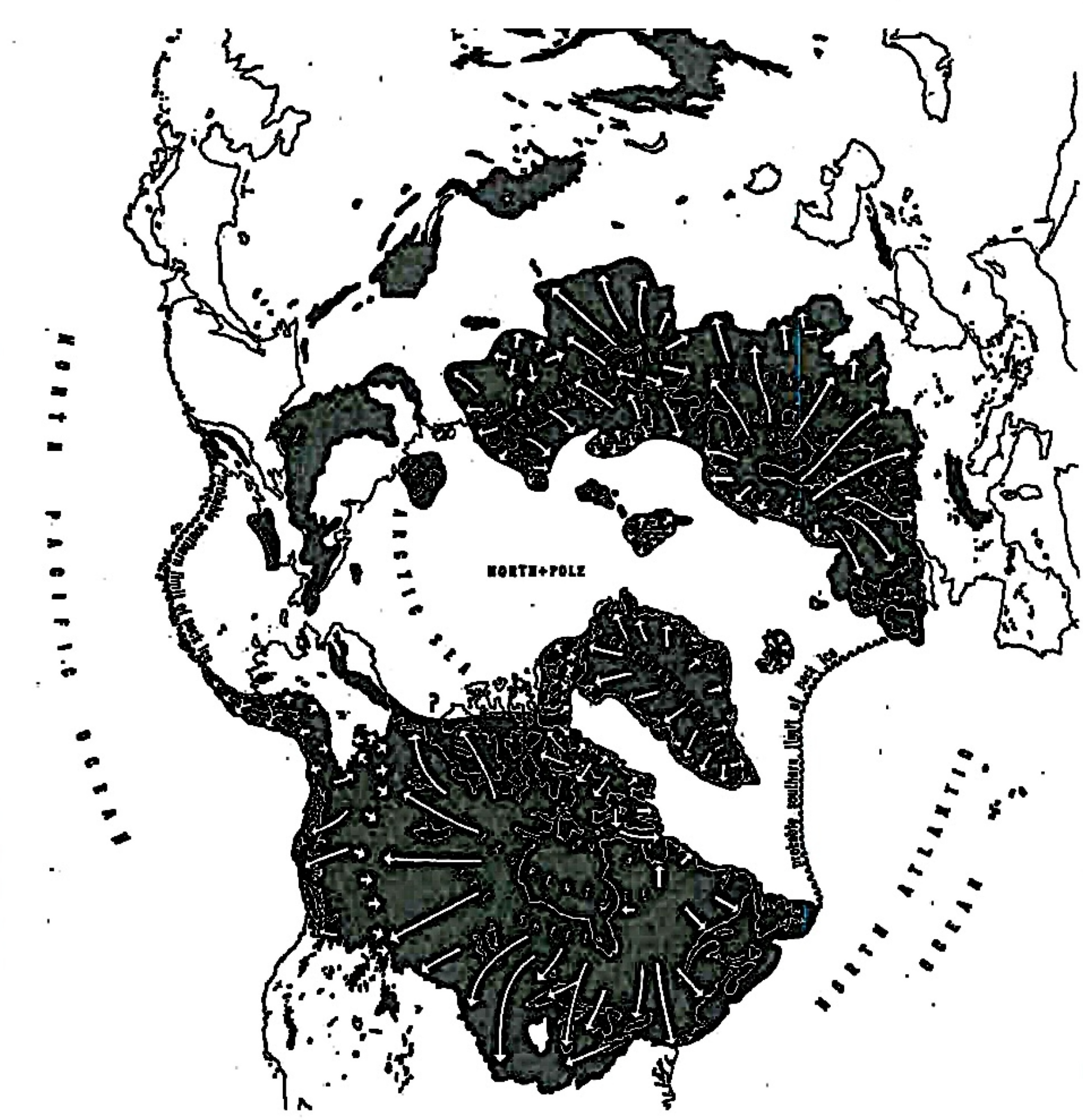
[7] R. Lovett, "Now You See It, Now You Don't," *New Scientist* (July 16-22, 2005), p. 50.

[8] *Ibid.*, p. 51.

[9] *Ibid.*

[10] *New Scientist* (November 27, 2004), pp. 32-33.

[11] R. Lovett, *loc. cit.*

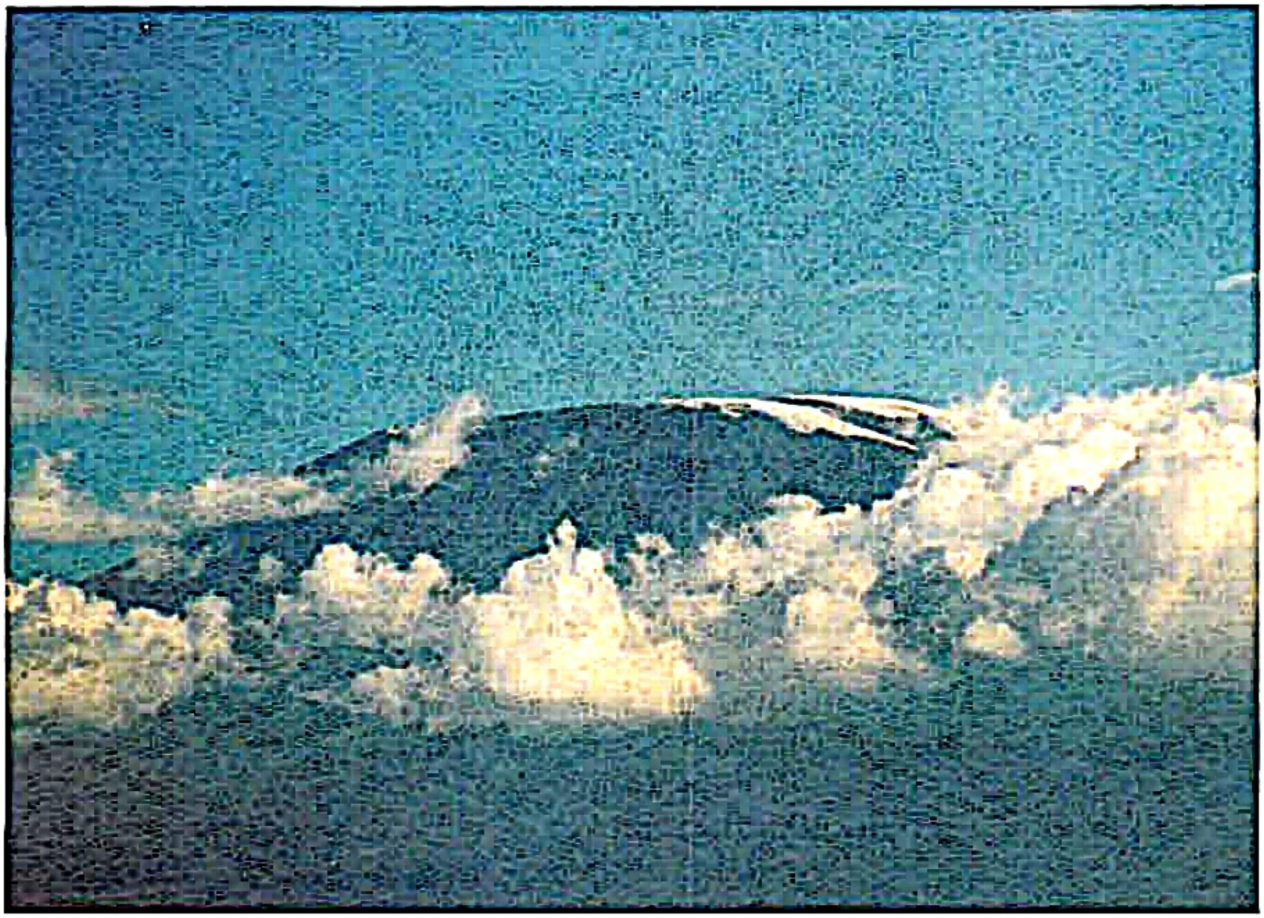


Conjectured direction of glacier flow during the Pleistocene Ice Age.

in radiation hasn't cooled our planet."[1] By the same token, glacial advance, especially on high mountains, is not necessarily synonymous with a *cooling* climate.

Mountains aside, no glacial evidence has ever been found on tropical lowlands—at least none that could be dated to the Pleistocene. And in fact it has long been known that tropical

[1] "Ain't No Sunshine," *New scientist* (January 28—February 3, 2006), p. 5.



The diminished glaciers of Mount Kilimanjaro, Tanzania.
(Photograph by the author.)

and sub-tropical regions "were largely untouched by the most recent advances."[1] True enough, evidence of glaciation in tropical India, Brazil, South Africa, and Australia has been known since the mid nineteenth century. But these were dated to a *pre*-Pleistocene epoch.[2]

So what?—one might ask. Under our scheme, all ice ages would have developed through the same mechanism. What holds true for the Pleistocene Ice Age should hold true for previous ones. Originally, in fact, this constituted just as much a problem for orthodox geologists. But then continental drift came to their aid, as it also comes to ours.

"At first," wrote Windsor Chorlton, "the only explanation seemed to be that glaciers had in fact overwhelmed the whole world, from the Poles to the Equator."[3] With the belated acceptance of shifting continents, however, "the paradoxical evidence of glaciation near the Equator" was solved.

> "The areas in question [Chorlton pointed out] had been located much closer to the polar regions when ice sheets covered them. Indeed, it has since become clear that

[1] W. Chorlton, *op. cit.*, p. 139.

[2] *Ibid.*

[3] *Ibid.*

glaciation of sufficient scale to be called an ice age can occur *only* when large parts of the earth's land surface are located *near the Poles or in high latitudes*."[1]

But then, in 2002, following a funded study conducted in the Peruvian-Bolivian Andes, Geoffrey Seltzer and his colleagues came to the conclusion that the Andean ice fields deglaciated several thousand years before those in North America. Naturally enough this led them to believe that the tropics had warmed up that many years before the northern latitudes.[2] And this, of course, was considered something of a mystery since, according to all variations of the orthodox scheme, ice ages are ultimately caused by a reduction in solar radiation with their termination being due to an increase of solar heat. And since the Sun's rays impinge directly on the tropics, but tangentially on northern latitudes, it would be natural for northern latitudes to freeze before more southerly ones, and just as natural for tropical regions to warm up before northern ones. *But by several thousands of years?*

It was therefore understandable when Seltzer declared that: "If the tropics warmed earlier than the northern latitudes, as our study demonstrates, that means there is something else influencing climate change that we don't yet understand."[3]

Needless to say, this earlier warming of the tropics poses just as much of a problem for the scheme adhered to in this work. But how valid is the conclusion reached by the above study?

As Seltzer and his colleagues themselves confessed, the "precise timing" of the Pleistocene glacial maximum in the tropics "remains uncertain."[4] Also, while hundreds of moraines and cirques speak clearly of once-glaciated areas in the Andes, their age has never been adequately determined. The best estimates have been based on the organic remains in lake sediments.[5] In fact, the study in question was conducted at Lake Junin in Peru and Lake Titicaca on the Peru-Bolivia border. But although these lakes are respectively located at 13,000 and 12,500 feet above sea level, neither of them was overridden by glaciers.[6] The date of glacial retreat was actually ascertained from the same sediments that supplied the estimates for their previous advance. These dates, moreover, were calculated through radiocarbon analyses of various organic substances in the sediments.[7] But if, as has been claimed, far-distant supernovae and variations in Earth's past magnetic field can wreak havoc with Earth's radiocarbon content,[8] how much more would proto-Saturn's much nearer flare-up have disrupted our atmospheric carbon?

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[1] *Ibid.*, p. 141 (emphasis added).

[2] G. O. Seltzer, *et al.*, "Early Warming of Tropical South America at the Last Glacial-Interglacial Transition," *Science* (May 31, 2002), pp. 1685-1686.

[3] Quoted on CCNet (May 31, 2002).

[4] G. O. Seltzer, *et al., op. cit.*, p. 1685.

[5] *Ibid.*

[6] *Ibid.*

[7] *Ibid.*

[8] S. P. Burlatskaya, "The Ancient Magnetic Field of Earth," *Bulletin of the Academy of Science, USSR Geophysical Series* (English Translation), 4 (1962), pp. 343-345; R. E. Lingenfelter & R. Ramaty, "Astrophysical and Geophysical Variations in C14 Production," in I. U. Olsson (Ed.), *Radiocarbon Variations and Absolute Chronology* (Stockholm, 1970), pp. 513-535; J. C. Houtermans, *et al.*, "Reservoir Models and Production Rate Variations of Natural Radiocarbon," *Journal of Geophysical Research*, 78 (1973), pp. 1897-

What was then assumed is that, as the glaciers retreated, temporary lakes formed behind the terminal moraines and that these acted as sediment traps, thus impeding permanent lakes like Junin and Titicaca from accumulating deposits from the melting ice. This was made to account for the decisive shift from inorganic carbonate silt to an organic-rich sedimentation of the lakes.[1] However, if the radiocarbon dates are in error, so is the age of glacial retreat.

One thing these sediments indicated beyond a reasonable doubt is that during most of the Pleistocene, especially its late period, the tropical Andes enjoyed a wet, even if somewhat cold, climate. But this wet climate persisted through the period of deglaciation.[2] Moreover, while glacial retreat in the Andes is said to have been triggered by maximum solar insolation due to Earth's orbital configuration at the time, glaciers remained in a diminished state even when summer insolation reached a minimum[3]—which, let's face it, does not make meteorological sense.

Tropical glaciers still exist in the high Andes of Peru. And core drilling at these ice fields has revealed evidence which contradicts the conclusions reached by the above study. What these ice cores point to is a sudden change of climate—but one that took place around 5,200 years ago. Lonnie Thompson, professor of geological sciences, did not mince words when he announced that "something happened 5,200 years ago that was abrupt and very large-scale." This conclusion was partly based on the "remarkably preserved wetland plant" that was discovered under the ice along the margin of the Quelccaya ice cap which, when later tested, yielded viable DNA dating it to 5,200 years ago. And let us not make a case about how little can be learned from an isolated plant. In a slim core drilled out of a glacier one cannot expect an entire thicket. In the wild, plants are not normally known to thrive in isolation. Where there is one, there is bound to be others. Besides, similar results were obtained from cores retrieved from the ice fields on Mount Kilimanjaro in Tanzania.[4]

What all this means is that, prior to that time, rather than cold and wet, the area had to have been *warm* and wet—warm and wet enough for such plants to thrive. The chilling spell that gripped these areas 5,200 years ago would therefore have transpired long after the Ice Age had come to an end. As we shall be indicating in a future volume, the approximate figure of 5,200 years ago matches the date when Earth's previous ice-free polar caps were suddenly frozen due to a different, but related, catastrophic onslaught that transpired thousands of years after the Ice Age had come to an end.[5] It does not serve to invalidate the thesis presented here.

Under this scheme, the tropics *would* have been somewhat cooled due to proto-Saturn's period of slow chilling. But, due to the indirect radiative heat from our encasing plasmasphere in an area that was not shielded by Earth's toroidal plasmas, it was not cooled enough to produce an ice age. Thus only mountains and some high lands were glaciated.

1907; G. R. Brakenridge, "Terrestrial Paleoenvironmental Effects of a Late Quaternary-Age Supernova," *Icarus*, 46 (1981), p. 86; "Factors to Take into Account," *Chronology and Catastrophism Review* (2001:2), p. 46.

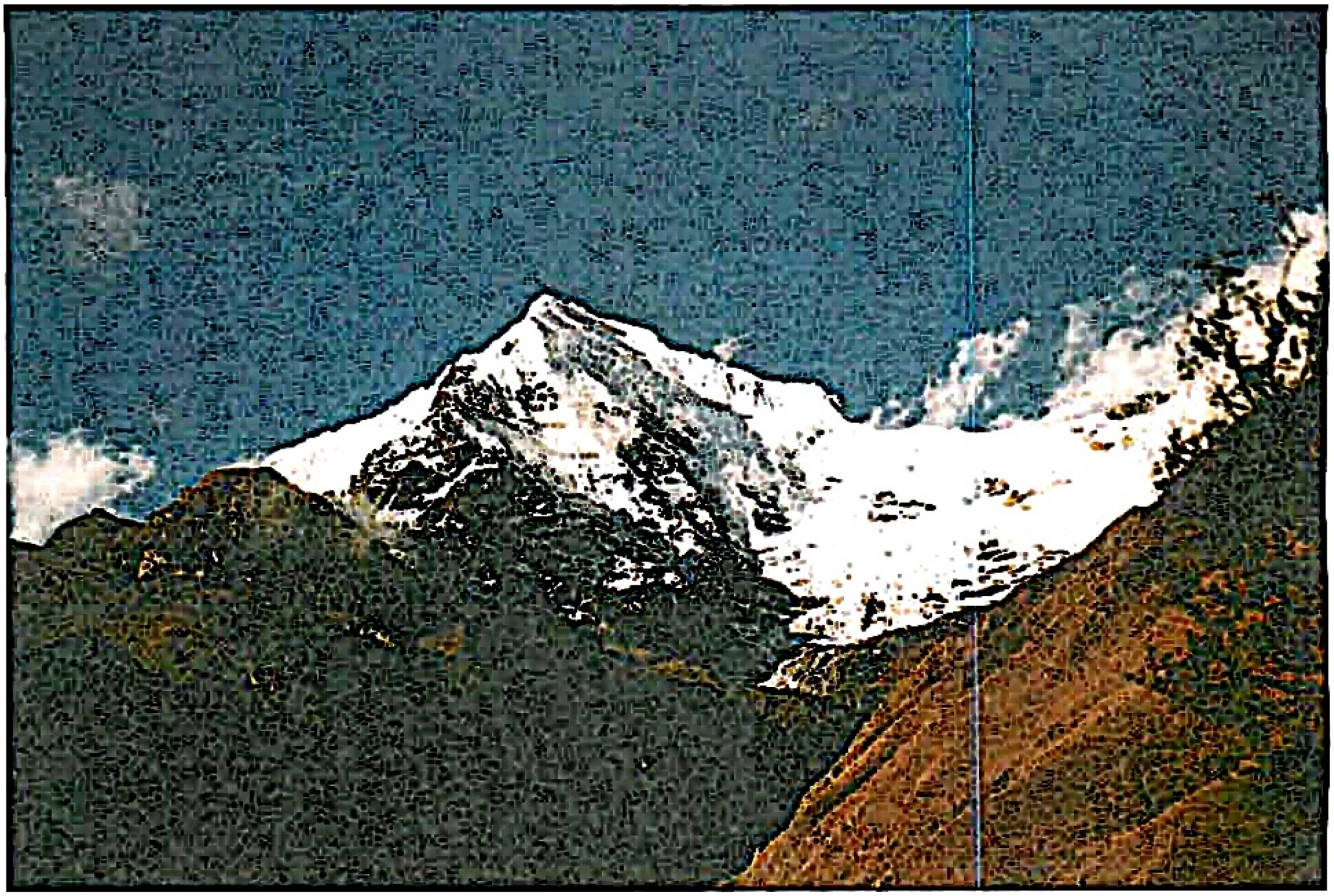
[1] G. O. Seltzer, *loc. cit.*

[2] *Ibid.*, p. 1686.

[3] *Ibid.*

[4] Ohio State University at http://researchnews.osu.edu/archive/quelcoro.htm (dated November 6, 2003).

[5] D. Cardona, "The Demands of the Saturnian Configuration Theory," *AEON* VI:1 (February 2001), pp. 69-71.



The glaciers of volcanic Mount Veronica, Peruvian Andes.
(Photograph by the author.)

Even so, we *do* encounter a different situation when it comes to Earth's *south* polar region.

THE EAST ANTARCTIC ANOMALY

Much like Earth's Arctic regions, during times in the past, the Antarctic continent is also known to have basked in unglaciated warmth.[1] As elsewhere, this transpired during those long balmy periods between ice ages. The quandary here is that there is no indication that any part of Antarctica was ice-free *during the Pleistocene Ice Age*. In a way, this would be in keeping with our posited model since there would have been no sub-stellar sun positioned above Earth's south pole to keep the land directly beneath it warm during that period. But there is more to it than that, so just hold on for a while.

For some obscure reason, depending on which authority one adheres to, it is generally believed that the eastern portion of the Antarctic continent has been dominated by its miles-thick ice sheet from somewhere between 55 and 15 million years ago up to the present.[2] The western section of Antarctica, so we are told, has a different story to tell. The claimed divergence for these two halves of the same continental mass might speak well for the hypothesis

[1] B. Bryson, *A Short History of Nearly Everything* (Canada, 2004), p. 432; *God Star*, pp. 368-369.

[2] R. A. Bindschalder & C. R. Bentley, "On Thin Ice?" *Scientific American* (December 2002), p. 101.

that West and East Antarctica had originally comprised two separate land masses which locked into each other, elevating the Transantarctic Mountains in the process, but it raises problems of its own.

For one thing, how can they vouch for 15 million years of continual ice coverage? Take, for instance, the claim that "by 1982, scientists had managed to pierce *all the way through* the sheets of both Greenland and Antarctica."[1] The retrieved cores, in this case, were said to contain "continuous layered records of annual snowfalls going back *perhaps* 125,000 years."[2] By 1987, the deepest core retrieved from East Antarctica, at the Russian Vostok base, was only said to cover 150,000 years?[3] Toward the end of 2005, it was again claimed that: "One of the most pivotal climatic discoveries of the past 30 years has come from ice cores in Greenland and Antarctica."[4] The report then adds that *some* of these records *can* go back more than 500,000 years.[5] But this was nothing new since it had been preached as far back as 1983. As Windsor Chorlton had stated at the time: "The age of the oldest of this ice has not yet been determined, but scientists think that just above the bedrock of East Antarctica lies ice that was formed 500,000 years ago."[6]

But then, even as I was writing this, newspapers were carrying the following AFP report: "Japanese researchers said...they had dug up ice from 3,000 metres down in the Antarctic Ocean estimated to be one million years old..."[7] So how could they have claimed 15 million years for the age of Antarctica's ice in 2002 when, in 2006, actual cores could only be claimed to have reached ice that was only one million years old?

Ice core ages are determined by counting the annual accumulation layers which appear as visible bands, a difficult enough task since, due to increasing pressure, the deeper one goes, the thinner do these bands become. Yet even so, this is only possible for relatively recent ice.[8] For deeper cores, glaciologists rely on radiocarbon dating and seasonal variations in gases which are derived from the air bubbles trapped in the ice.[9]

It is not, however, without reason that some have looked upon this method, to say nothing of the entire interpretation of ice core dating, with suspicion. Nor is this only true of so-called fringe, or pseudo, scholars. Zbigniew Jaworowski, a Polish multidisciplinarian of international fame, asserts that evidence derived from glacial ice samples "are based on fudged data and ignorance of the physical processes of glacial ice formation" and goes right out in condemning ice core data as an "outright fraud."[10]

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[1] W. Chorlton, *op. cit.*, p. 110 (emphasis added).

[2] *Ibid.* (emphasis added).

[3] S. W. Matthews, "Ice on the World," *National Geographic* (January 1987), p. 96.

[4] C. J. Allègre & S. H. Schneider, "The Evolution of Earth," *Scientific American* (September 2005 Special Edition), pp. 11-12.

[5] *Ibid.*, p. 12.

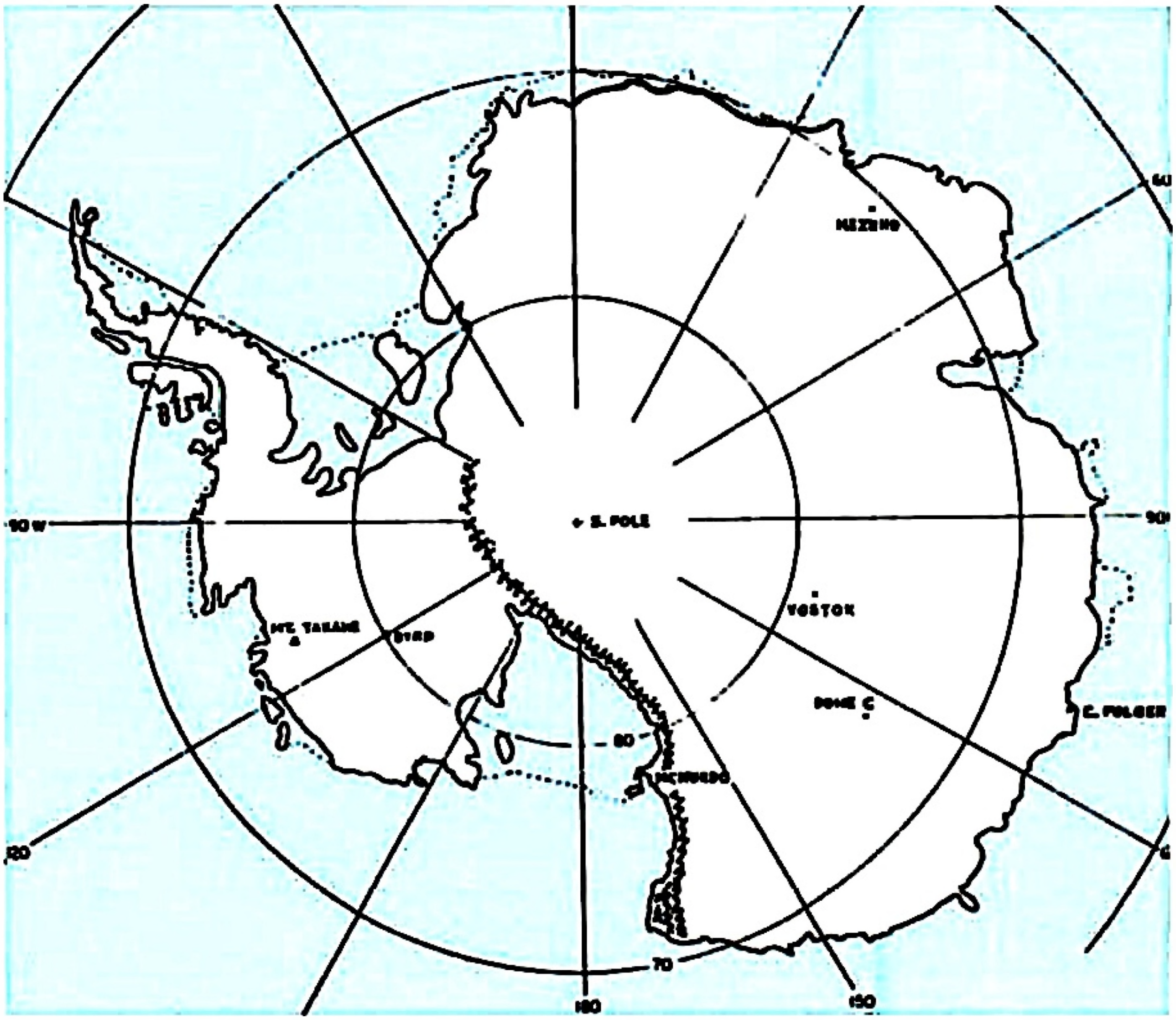
[6] W. Chorlton, *op. cit.*, p. 152.

[7] AFP, "Ice Million Years Old," *The Province* (January 25, 2006), p. A23; "Oldest Ice," *New Scientist* (January 28-February 3, 2006), p. 5

[8] *Ibid.*

[9] W. Chorlton, *op. cit.*, p. 158.

[10] Z. Jawarowski, "Ice Core Data Show no Carbon Dioxide Increase," *21st Century* (Spring 1997), p. 42.



The Antarctic continent, showing the Transantarctic Mountains which divide West Antarctica (to the left) from the larger East Antarctica. Also indicated are the drill sites which produced the ice cores discussed in the text

And, let's face it, there *is* something disconcerting when one ice core is compared to another. Thus, for instance, ice 300 meters deep in the Vostok core has been calculated to be 12,000 years old. But ice at the same depth in a core retrieved from the south pole has been estimated at only 3,200 years old.[1] Fair enough, it is claimed that while snow accumulation at the south pole is scant, there is even less annual snowfall at the Vostok base.[2] But, even granting that this has always been the case, is this difference really enough to account for a divergence of 9,000 years?

When it comes to deeper ice, there is also no doubt that the radiocarbon method cannot be relied on, at least not as an absolute dating technique. "The radiocarbon method is still not

[1] B. Hodgson, "Antarctica: A Land of Isolation no More," *National Geographic* (April 1990), p. 34.
[2] *Ibid.*

capable of yielding accurate and reliable results," wrote R. E. Lee. "There are gross discrepancies, the chronology is uneven and relative, and the accepted dates are actually *selected* dates."[1] According to R. Stuchenrath, whom Lee cites, the "whole blessed thing is nothing but 13th century alchemy and it all depends upon which funny paper you read."[2]

When it comes to the trapped gases in these ice cores, Jaworowski has just as much confidence since, as he showed, these can, and do, fluctuate several times a year within the same accumulation of ice and can thus lead to false age estimates.[3]

Besides, when all is said and done, even those who continue to uphold the virtual validity of ice core dating do so with reservation. For one thing, as Chorlton stated, "the findings suggest that the deep ice contains many secrets yet to be unveiled."[4] For another, 10,000 years has been determined as "about the practical limit" for the dating of deep ice.[5] Brian Hills even vouches for a lower limit when he asserts that "annual changes in ice older than ca. 8000 years become harder to see and the data is less dependable."[6]

CLEARER EVIDENCE FROM WEST ANTARCTICA

When it comes to *West* Antarctica we meet an entirely different set of data. For one thing, although still talking in millions of years, it has been ascertained that the west continent's ice sheet has melted and reformed time and again.

> "About 55 million years ago, small glaciers began to form in Antarctica. *Growing for a time, then shrinking and growing again*, they gradually expanded and coalesced into a dome-shaped ice sheet that by twenty million years ago had spread out so that it covered the whole continent."[7]

As already noted, between these thaws and re-freezing episodes, Antarctica was quite warm.[8] Additional evidence of a previous warm Antarctic climate continued to surface with the passing years. Among this evidence was the discovery of marine plants and fossilized trees, with their roots still intact, high on the upper slopes of the Transantarctic Mountains.[9] Coal seams running through this chain are considered to be among the most extensive on Earth.

One of the cores drilled out of the Antarctic ice sheet contained a leaf from a southern beech tree trapped between two ice-deposited gravel beds.[10] (Keeping in mind what we have

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[1] R. E. Lee, "Radiocarbon: Ages in Error," *Anthropological Journal of Canada*, 19 (1981), p. 27 (emphasis added).

[2] R. Stuchenrath, *Annals of the New York Academy of Sciences*, Vol. 288 (1977), p. 188.

[3] Z. Jawarowski, *op. cit.*, pp. 44-45.

[4] W. Chorlton, *op. cit.*, p. 110.

[5] S. Mewhinney, *Ice Cores and Common Sense* (April 1989), p. 45.

[6] B. Hills, *Origins: Cosmology, Evolution & Creation* (Cambridge, 2003), p. 164.

[7] W. Chorlton, *op. cit.*, p. 18 (emphasis added).

[8] *God Star*, pp. 368-369.

[9] *New Scientist* (July 3, 1986), p. 22; S. W. Matthews, *op. cit.*, pp. 96, 97.

[10] *New Scientist* (February 5, 1987), p. 44.

already divulged in relation to downpours of naphtha, it should not surprise the reader that the core in question also contained a two-meter-thick layer of sand stained with asphalt residue.[1]) Actually, *entire* layers of beech leaves were eventually discovered in the Transantarctic Mountains.[2] As one report indicated, this "shows that trees not only once grew in the area but also were able to re-establish themselves following extensive glaciation."[3] As Peter-Noel Webb noted, this would mean that "temperatures in Antarctica were much warmer *much later* than has been thought."[4]

> "Exactly when the continent's summer temperatures came to average 10°F below zero—as they do now—is still unknown. But Webb's colleague David M. Harwood of the University of Nebraska notes that it would have to be at least 50 degrees warmer for beeches to grow."[5]

In keeping with the theory of continental drift, it was then supposed by some that Antarctica was originally situated away from its present frigid area—some even vouching for a former attachment to *North* America which was then close to the equator[6]—and thus enjoyed a warmer climate, before it drifted to its present cold locality. But since it is now obvious that the continent has gravitated in and out of alternating warm and cold temperatures, the above theory would demand that the Antarctic landmass has drifted in and out of its present polar position time and again—which is hard to swallow.

Defective theories can however be patched up. While it continued to be believed that Antarctica was once joined to South—but not to North—America and Australia,[7] it now seemed as if it were the other continents that moved away, leaving Antarctica in the south polar region where it has apparently always been.[8] But how, then, account for its warm periods?

In an attempt to reconcile these bothersome anomalies, it was suggested in the 1980s that the ocean had formerly flowed right through the continent's interior, the western portion of which had at that time been a close-knit group of islands.[9] (In actuality, this had already been proposed in 1949 by C. Brooks.[10])

Vegetation is then assumed to have carpeted the slopes of what was then the sea-kissed Transantarctic Mountains during a warm spell. Fossil remains from this herbage are then

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[1] *Ibid.*

[2] "An Antarctic Forest Grows New Theories," *National Geographic* (August 1991), "Geographica" section.

[3] *New Scientist* (February 5, 1987), p. 44.

[4] "An Antarctic Forest Grows New Theories," see above (emphasis added).

[5] *Ibid.*

[6] "Antarctica and North America: Long Lost Kin?" *National Geographic* (December 1991), "Geographica" section.

[7] J. Berendt & S. Brewer, "Explorers Find First Traces of Antarctic Mammals," *GEO* (June 1982), p. 125.

[8] M. A. Cook, "Earth Tectonics Viewed from Rock Mechanics," *Chronology and Catastrophism Review*, XIII (1991), p. 15; B. Hodgson, "Antarctica: A Land of Isolation no More," *National Geographic* (April 1990), pp. 27, 29.

[9] S. W. Matthews, *op. cit.*, p. 97.

[10] C. E. P. Brooks, *Climate Through the Ages* (N. Y., 1949), p. 245.

supposed to have been thrust up the mountain flanks by the spreading glaciers when temperatures cooled. However, in order for all this to have worked, it also had to be conjectured that the mountains themselves would have been raised during the process.[1] But then, as I. Anderson reported: "The problem is that Antarctica does not have a history of seismic activity necessary for rapid mountain building."[2]

By 1990 it began to be suspected that the landmass which constitutes Antarctica is composed of rocks of different ages, from which it was deduced that the present mainland was formed through the collision of two separate continental masses.[3] Some might then see this as accounting for the former partition of East and West Antarctica along the Transantarctic Mountain divide through which the ocean had previously flowed. However, the ocean is supposed to have flowed on *both* sides of the Transantarctic Mountain chain with very little of west Antarctica above water.[4] This submerged portion of the Antarctic landmass might then be viewed as having been raised above the ocean due to the dropping of sea levels which, in their turn, were caused by the accumulation of glaciers.

Isostatic equilibrium, however, would not have permitted this. With 90 percent of the world's entire load of ice concentrated in Antarctica,[5] the weight of its glaciers should have compensated for the dropping sea levels, and the larger part of the continent should still be underwater. This is more than evident by North America's Great Lakes region, to say nothing about all of Scandinavia, which are still rebounding from the release of their past icy burden.[6]

In the meantime, further signs of a much warmer Antarctica continued to cause problems for prevailing theories.[7] As exploration continued, researchers came to the conclusion that Antarctic ice "has fluctuated dramatically in the past few million years, *vanishing outright from the entire continent once* and from its western third *perhaps several times*."[8] The final verdict was that "interior areas of Antarctica may have been free of ice far more recently than had been supposed."[9] And although this made news in the early 1980s, it was not really new. Basing his judgement on the erosion that is evident in the Edsel Ford Mountains, Thomas Henry had already, some thirty years earlier, reached the conclusion that Antarctica was once "essentially free of ice."[10]

To be sure, the growth of the beech forest discussed above has been correlated to a collapse of the ice sheet some three million years ago.[11] Additional evidence has however indicated that periods of unusual warmth had to have occurred much later in time, as late as

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[1] B. Hodgson, *op. cit.*, p. 39; S. W. Matthews, *op. cit.*, pp. 95, 97; I. Anderson, "A Glimpse of the Green Hills of Antarctica," *New Scientist* (July 3, 1986), p. 22.

[2] *Ibid.*

[3] B. Hodgson, *op. cit.*, p. 43.

[4] S. W. Matthews, *op. cit.*, p. 97.

[5] B. Bryson, *op.* cit., p. 273; S. W. Matthews, *op. cit.*, pp. 94, 97.

[6] *Ibid.*, p. 91.

[7] *New Scientist* (October 10, 1992), p. 17.

[8] *Scientific American* (March 1993), pp. 7-10 (emphasis added).

[9] "Marine Fossils on Icy Mountains," *Globe & Mail* (July 22, 1983).

[10] T. R. Henry, *The White Continent* (N. Y., 1950), p. 113.

[11] *Scientific American, loc. cit.*

400,000 years ago and again in something less than 200,000 years ago.[1] This last estimate was supposed to reflect the most recent retreat of ice in Antarctica, but, as we have seen, ice cores retrieved from the Vostok base had a different story to tell. As the French glaciologist Claude Lorius reported in 1985: "The Vostok core is the first to cover, *completely and unambiguously*, the entire last 150,000 years of earth's ice-age cycle."[2] Just as in Earth's north polar region, according to this core, Antarctica warmed up again some 10,000 years ago following a comparative glacial stage, but then re-froze some 5,000 years later before warming up once more to present temperatures.[3] And so, likewise, according to cores retrieved from the Byrd and Dome C stations.[4] Are these not the very same bench-mark dates we have been proposing in our evolving scenario?

THE SOUTHERN OVAL

Even that most modern of crutches, computer simulation, has failed to alleviate the problems all of the above poses for glaciologists. "As far as Antarctica is concerned," Olav Orheim admitted, "we have no real confidence in today's computer-generated models, because none of them can explain how the previous ice age came to an end."[5]

But let us concentrate on the 10,000-year old core sections retrieved from East Antarctica, not only because these happen to match our bench-mark date, but also because these fall within the "practical limit" of accurate dating. This Antarctic-derived date, which is considered transitional from a cold to a much warmer climate, is "reasonably close" to those obtained from Greenland.[6] "This," Sean Mewhinney rightly noted, "should inspire a certain amount of confidence."[7]

There are, however, two problems yet to solve because, for one thing, despite the evidential warming trend at this date, there is at present no indication that the ice sheet withdrew completely from Antarctica the way it *almost* did in the northern hemisphere. While we have noted the claim that, *at various times in the past*, both West and East Antarctica were apparently free of ice, the dates for these ice-free interludes fall far earlier than our posited bench-mark. Why is that?

The other problem concerns the extent of the ice. While there was no proto-Saturnian sun stationed directly above Earth's south pole to keep the ice from accumulating there, any shadow thrown by the debris-laden toroid which eventually evolved into the southern auroral oval should have left the southernmost regions directly beneath its centre out of its umbra. This should then have created a glaciated ribbon, with an ice-free centre, very much as in the Arctic, rather than the total ice cap dictated by what has so far come to light in the Antarctic.

Where, if anywhere, could we have gone wrong?

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[1] *Ibid.*

[2] S. W. Matthews, *op. cit.*, p. 96.

[3] B. Hodgson, *op. cit.*, p. 34.

[4] S. Mewhinney, *op. cit.*, p. 47, where other references are cited.

[5] B. Hodgson, *op. cit.*, p. 39.

[6] S. Mewhinney, *loc. cit.*

[7] *Ibid.*

Chapter 12

Plasma And All That

THERMALLY INCOMMENSURATE PLANETS

What we have learned so far indicates that, despite what many might consider an equal amount of solar radiation on both poles, Earth's south polar region is somehow colder than its northern one. But is this state of affairs unique to Earth?

"The warmest part of the atmosphere visible to the *Pioneer Venus* orbiter," noted Billy Glass, "is the North Polar region."[1] Which means that, very much like Earth, the south pole of Venus is colder than its northern one.

That planets are asymmetrical, both geologically and thermally, is also indicated by the planet Mars. As Maria Zuber reported, "the Martian crust is hardly a single homogeneous slab." On the contrary, "the northern and southern hemispheres of Mars have drastically different appearances."[2] Thus, for instance, the south pole is some 6 km higher than the north pole. The southern hemisphere is heavily cratered while the northern hemisphere displays far fewer scars.[3] Also, very much like Earth's Arctic region, the Martian north polar cap is riddled by what has been termed "an enigmatic pattern" of spiraling troughs and gullies.[4] Moreover, most of the Martian volcanoes are confined to the northern hemisphere,[5] which indicates a warmer regime than that in the southern one. But we need not rely on this inference since one of the Viking orbiters proved beyond a reasonable doubt that the southern cap is colder than its northern counterpart.[6]

It can thus be seen that Earth is not the only planet whose southern pole is colder than its northern one. (Why Venus and Mars are compatible with Earth in this respect will be revealed in a future volume of this series.)

When it comes to Saturn itself, we encounter a different situation, as in fact our theory demands. Swirls and bands in the atmosphere dominate the planet's southern hemisphere.[7] Infrared images have also shown "a mysterious dark spot" associated with its auroral region at the planet's south pole.[8] But, more importantly, similar infrared images taken by the Keck I telescope in Hawaii have also uncovered a "hot spot" at the south pole which has been said to

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[1] B. P. Glass, *Introduction to Planetary Geology* (N. Y., 1982), p. 312.

[2] M. T. Zuber, "Mars: The Inside Story," *Sky & Telescope* (December 2003), pp. 46-47.

[3] *Ibid.*, p. 47.

[4] S. M. Clifford, "The Iceball Next Door," *Sky & Telescope* (August 2003), p. 34.

[5] M. T. Zuber, *loc. cit.*; see also T. A. Mutch, *et al.*, *The Geology of Mars* (Princeton, New Jersey, 1976), p. 197; S. W. Carey, *Theories of the Earth and Universe* (Stanford, California, 1989), p. 314.

[6] S. M. Clifford, *loc. cit.*

[7] R. Talcott, "Cassini Targets Titan," *Astronomy* (February 2005), p. 75.

[8] M. Weinstock, "Hello, Saturn," *Discover* (January 2005), p. 48.

"indicate a warm polar area."[1] Touted as "the first such hot vortex ever discovered in the solar system," it is presently "believed to contain the highest temperatures on Saturn." Seasonality, as a cause, has been ruled out and, as of this writing, astrophysicists remain bewildered. "A really hot thing within a couple degrees of the pole," Glenn Orton, from NASA's Jet Propulsion Laboratory, reported, "is something I don't understand at all."[2] And before it is pointed out that this is the opposite to the other examples we have given, in that Saturn's south pole seems to be warmer than its northern one, rather than vice versa, keep in mind that, during the proto-Saturnian system's existence, proto-Saturn had its *southern*, and not its northern, pole directed toward Earth. And it is from proto-Saturn's south pole that the Birkeland current which formed the polar column, or *axis mundi*, was generated. This generation would have been accompanied by an immense electric surge which would have heated the column as well as its point of origin, to say nothing of its point of contact.

PLASMASPHERIC SHAPES

In view of the above it can be said that the colder climate at Earth's southern pole is not the result of its present environmental place in relation to the Sun. Yes, Earth's poles remain frozen because the rays of the Sun reach them at an acute angle, thus robbing them of their full force. But this does not explain why one pole should be colder than the other. As with the bodies examined in our last section, what we see at Earth's south pole is a relic of what transpired in the past. In other words, Earth's southern polar region must have been colder than its northern one even when our world was still a satellite of proto-Saturn.

This is indicated by the manner in which the two polar regions reacted in response to the warming spell that ended the Pleistocene Ice Age. As has been pointed out by others, while the eradication of the North American and European ice sheets "occurred suddenly as a result of a few degrees of warming...much of West Antarctica's ice survived."[3]

This, in turn, brings us to the rate of melting of the southern ice. What follows is telling because, under the presently accepted orthodox scheme, *but not in ours*, the north and south glaciated latitudes should have melted simultaneously. As Robert Bindschadler and Charles Bentley indicated, "geologic evidence near the U. S. McMurdo Station [in Antarctica] suggests that the ice sheet retreated through that area very rapidly around 7,000 years ago."[4] The rest of "Antarctica's thick blanket of ice...has been contracting, mostly gradually but sometimes swiftly, since the *height* of the last ice age, 20,000 years ago."[5] But, generally speaking, "the ice gripping the planet's southernmost continent remained essentially intact..."[6] Why was this so?

The evidence retrieved from loose rocks on the slopes of the Edsel Ford Mountains on West Antarctica has indicated that these mountains, some of which now jut nearly half a

[1] *Discover* (April 2005), p. 11.

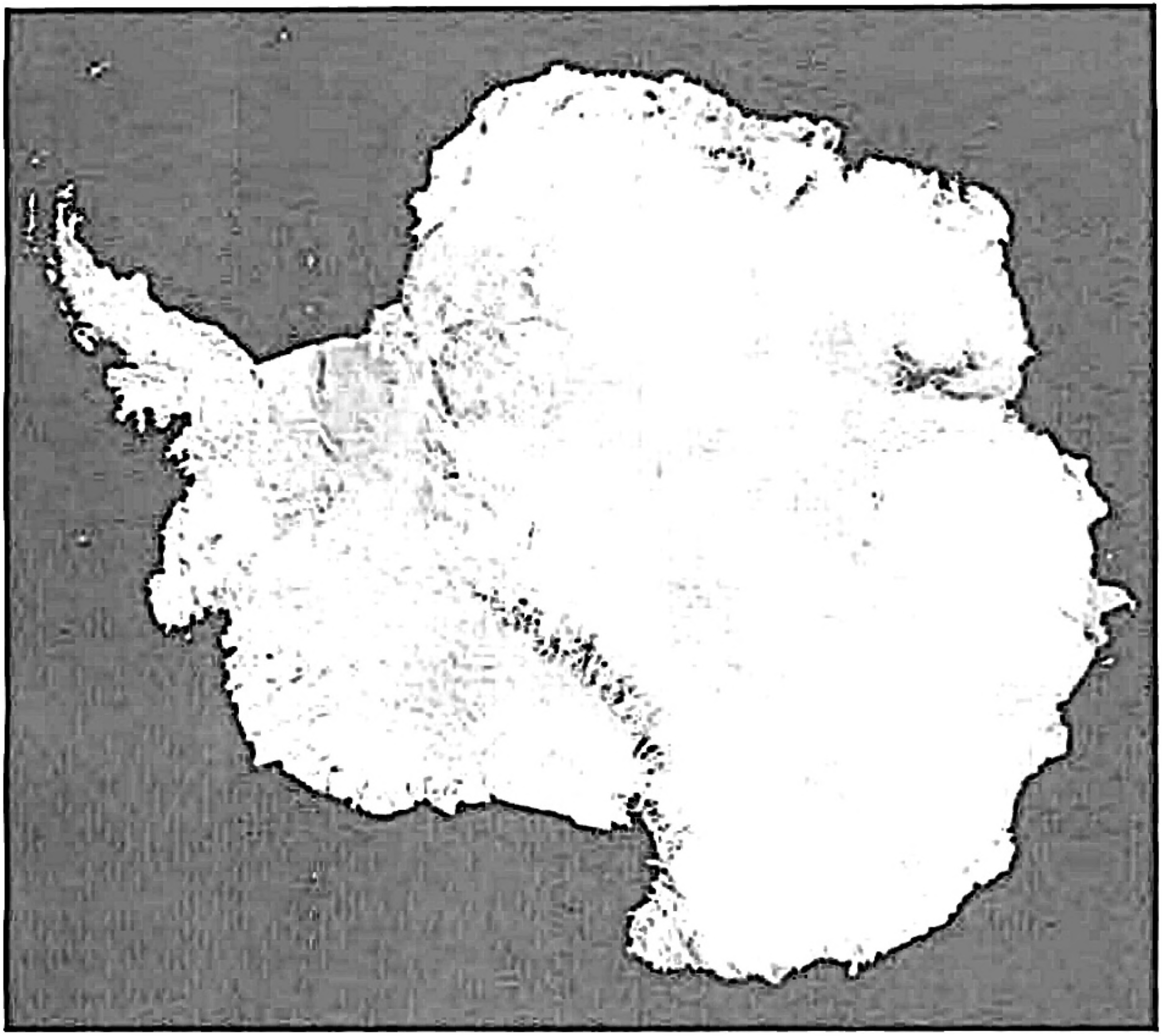
[2] Cable News Network LP, LLLP—CNN.com—February 4, 2005.

[3] R. A. Bindschadler & C. R. Bentley, "On Thin Ice?" *Scientific American* (December 2002), p. 105.

[4] *Ibid.*, p. 104.

[5] *Ibid.*, p. 101 (emphasis added).

[6] *Ibid.*, p. 100.



Composite satellite photograph of Antarctica.
(Image courtesy of NASA.)

mile above the ice, were still completely buried by glaciers 10,000 years ago. By calculating when these rocks were glacially dislodged, it has been concluded that the West Antarctic ice sheet "has been melting and contributing water continuously to the ocean for the last 10,000 years." But what most surprised glaciologists is "how recently the ice has thinned in West Antarctica." At a time when the northern glaciers had all but disappeared, deglaciation in West Antarctica had only just commenced.[1] Why this difference?

As should be clear by now,[2] light and heat would have been radiated to all of Earth's latitudes through the proto-Saturnian system's encasing plasmasphere, thus ensuing a seasonless

[1] G. Balco, *et al.*, "Antarctic Ice Sheet has been Melting Naturally for 10,000 years," as reported on CCNet, January 8, 2003.
[2] And see here *God Star*, pp. 297-303.

The frozen wastes of Antarctica.
(Photograph courtesy of NASA & the Carnegie-Mellon University.)

terrestrial environment.[1] But, as we had also warned in passing, Earth would still have been "subjected to slightly different latitudinal temperatures."[2] The main reason for this slight difference was due to the fact that Earth's northern latitudes would have received direct heat and light from proto-Saturn in addition to that radiated by its plasmasphere, while its southern regions, needless to say, would have been bereft of this direct radiation. When it comes to ice ages, however, there was slightly more to it than that. It all had to do with the shape of proto-Saturn's plasmasphere.

That plasmaspheres abound in our Solar System within that of the Sun itself is now a given.[3] But plasmaspheres come in various shapes. Cometary plasmaspheres are elongated. And so, likewise, with the Solar System's planetary ones. Earth's magnetosphere, which is actually part and parcel of its plasmasphere, is shaped very much like a comet's tail. Venus, too, resides in a cometary-tail-shaped plasmasphere. And so, too, does Jupiter possess a similar, but much vaster, plasma sheath which stretches along its magnetic equator.[4]

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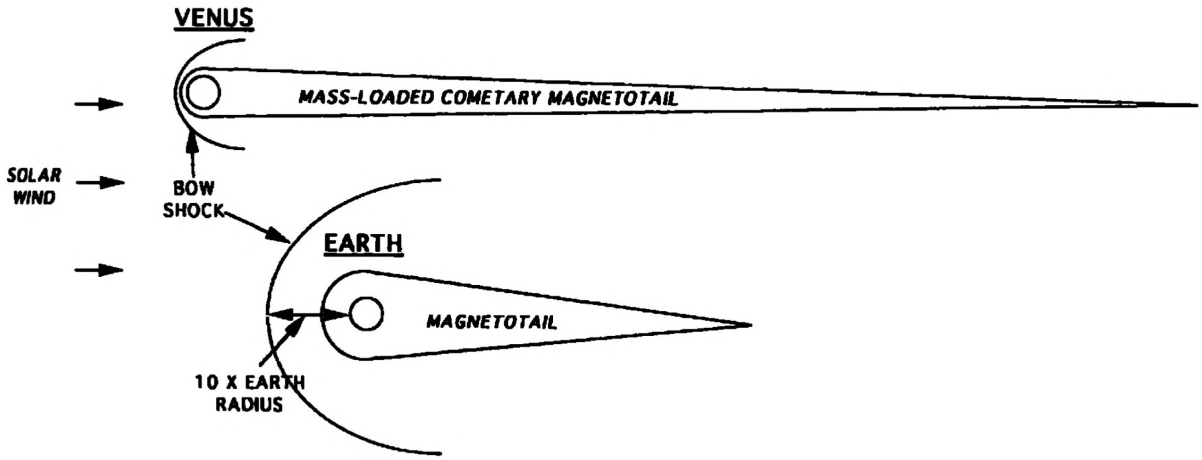
[1] *Ibid.*, pp. 351-390.

[2] *Ibid.*, p. 491.

[3] T. E. Cravens, *Physics of Solar System Plasmas* (Cambridge, 1997), p. 1 (emphasis added).

[4] W. Thornhill, *Chronology & Catastrophism Review* (2000:1), p. 94.

[4] NASA release as reported by W. Thornhill, "Did They Really Say That?" *Thoth* (electronic newsletter sponsored by KRONIA Communications) III:1 (January 24, 1999), p. 12; *New York Times* (May 29, 1999); *New Scientist* (August 7, 1999), pp. 26-31.



The stretched magnetotails—i.e. plasmaspheres—of Venus and Earth.

At present, the planetary plasmaspheres within our Solar System are in the dark mode and thus invisible, but not so cometary ones.

> "The [plasma] sheath [Wallace Thornhill tells us] is generally invisible unless the current is strong enough to generate light, such as on the Sun and in the coma and tails of comets...A comet spends most of its time in the outer Solar System where it achieves electrical equilibrium. So when it rushes briefly toward the Sun it finds a different electrical environment and a current flows, creating the cometary display."[1]

The standard explanation as to why the Solar System plasmaspheres stretch into comet-like tails is that this distention occurs because the plasmaspheres are compressed on the sunward side by the solar wind.

Such distended plasmaspheres, however, are not restricted to our Solar System. It would have been surprising had they so been. Out in the reaches of space, a star in association with an exoplanet has been found to be surrounded by just such "a huge comet-like envelope" forming what has been termed an "exosphere" around both of them.[2] Although Sara Seager shied away from a plasmaspheric explanation, what this huge comet-like envelope actually amounts to is a plasmasphere. Seager said nothing about any stellar wind that might be responsible for this comet-like envelope. The solution she offers in its stead has to do with the star's ultraviolet flux heating a fair amount of hydrogen in the planet's upper atmosphere, enabling it to escape and form the exosphere in question. "It remains unclear [as of 2006]," she then adds, "whether the planet has lost a significant amount of its mass by this mechan-

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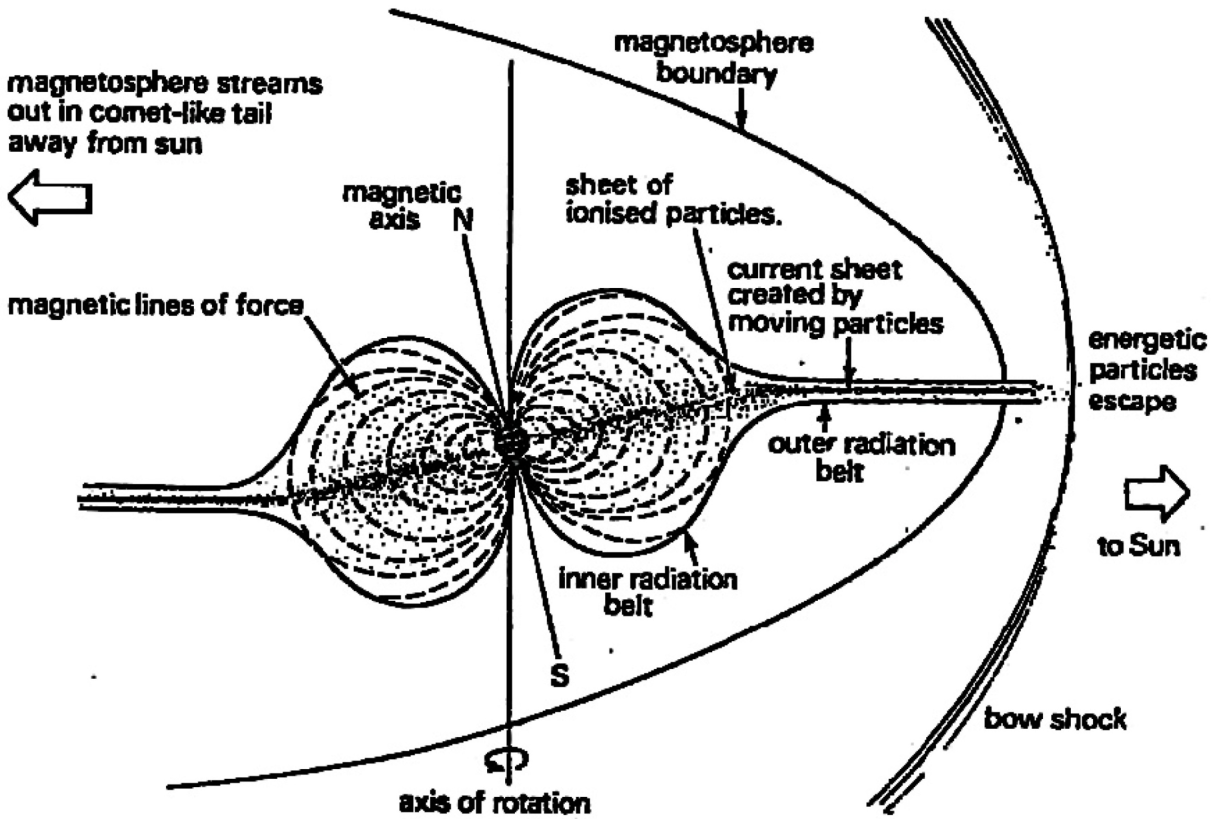
[1] W. Thornhill, "Evidence for the Extreme Youth of Venus," *Chronology and Catastrophism Review* (1993 Special Issue), p. 87.

[2] S. Seager, "Unveiling Distant Worlds," *Sky & Telescope* (February 2006), p. 32.



Jupiter's magnetosphere which is part and parcel of its plasmasphere.

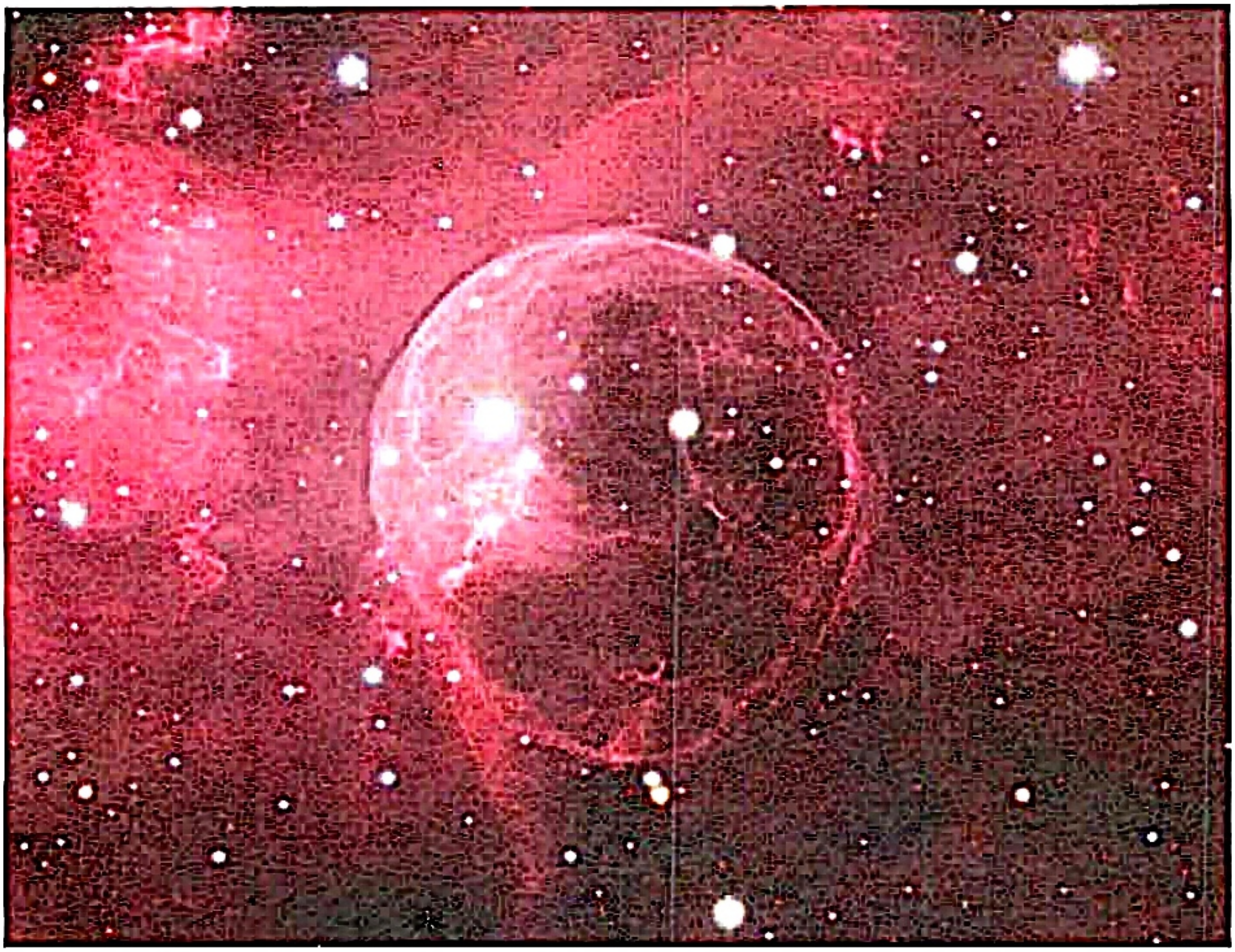
ism."[1] Would it not have made more sense to blame it all on the same, or a related, cause which stretches planetary plasmaspheres in our own Solar System?

What must not be lost track of is that the planetary plasmaspheres in our Solar System are all contained within the Sun's own plasmasphere, that is, the heliosphere. Although the actual shape of the heliosphere in its entirety is still unknown as of this writing, comparison of the data dispatched by Voyager 1 with that sent by Voyager 2 has suggested to scientists that the edge of the heliosphere's termination shock "is about one billion miles closer to the Sun in the southern region of the solar system than in the north."[2]

> "This [Ker Than explains] implies that the heliosphere, a spherical bubble of charged low-energy particles created by our Sun's solar wind, is irregularly shaped, bulging in the northern hemisphere and pressed inward in the south."[3]

Notice that, very much like Seager, Than, too, shied away from referring to the Sun's heliosphere as a plasmasphere. But let that pass. The one thing to keep in mind here is that

[1] *Ibid.*
[2] K. Than, "Voyager 2 Detects Odd Shape of Solar System's Edge," *Space.Com* (May 23, 2006).
[3] *Ibid.*



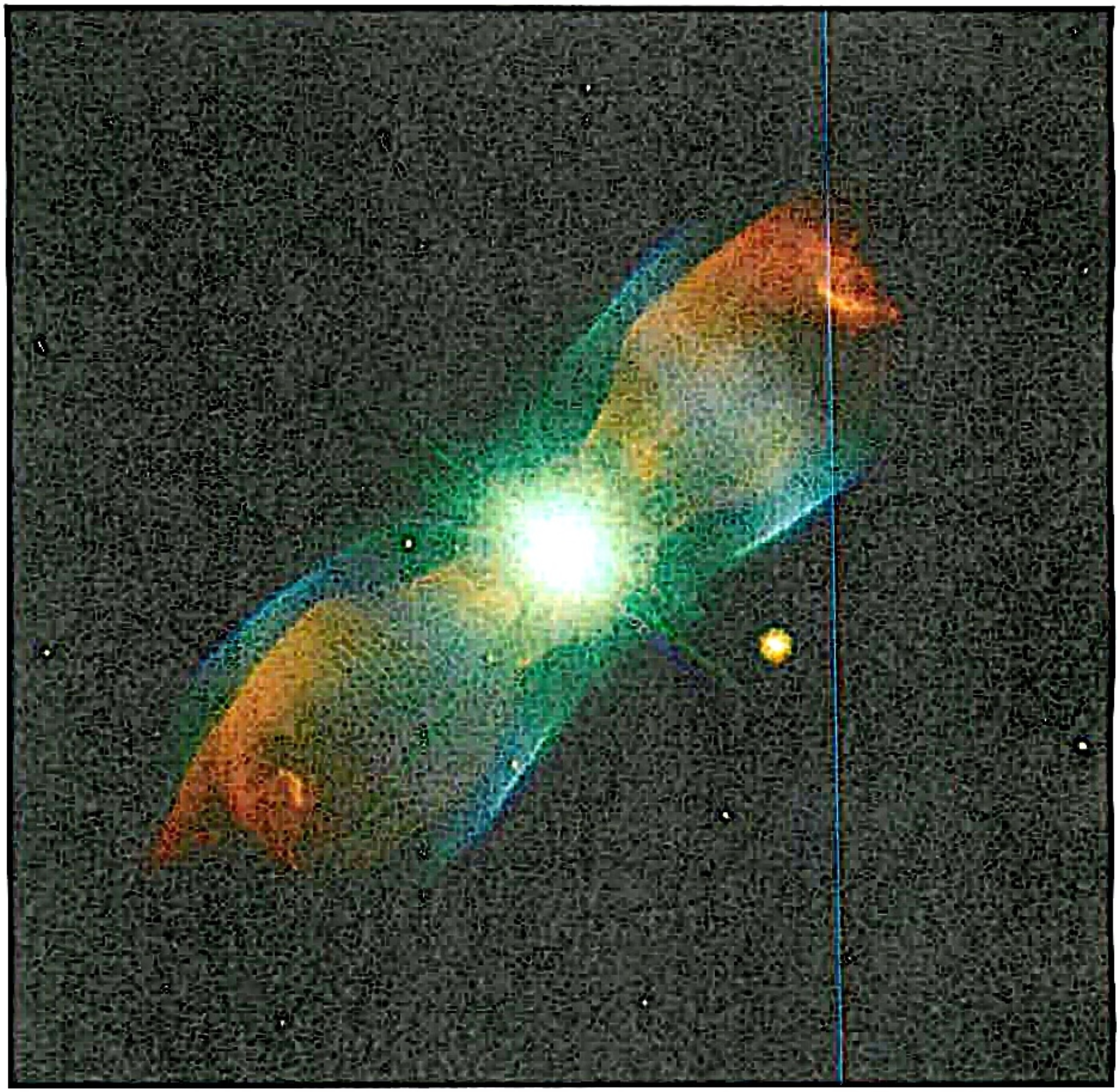
The Bubble Nebula
(Photograph courtesy of NASA.)

Than's description of the Sun's heliosphere as "a spherical bubble" does not imply perfect sphericity. As Hank May explained:

> "[It needs to be pointed out] that orthodoxy does not believe that the heliosphere is spherical...indeed, many descriptions of it are prefaced by the caveat that the term is a misnomer...it is not spherical at all, and the Sun is not at its center. But it is drawn as a sphere in many illustrative examples (mainly intended for the lay public), with the Sun in center."[1]

This is not to say that near-perfect spherical plasmaspheres do not exist. One such example is the Bubble Nebula, catalogued as NGC 7635, a colossal sphere about six light years across, some 11,300 light years away. Granted, it is not a perfect sphere, nor is the star that spawns it exactly at its centre. Its surface, too, is not quite uniform but exhibits a rippled

[1] H. May, on Intersect, private discussion group sponsored by KRONIA Communications (May 26, 2006); see also article by E. C. Stone, *Science* V:203:55 (2001).

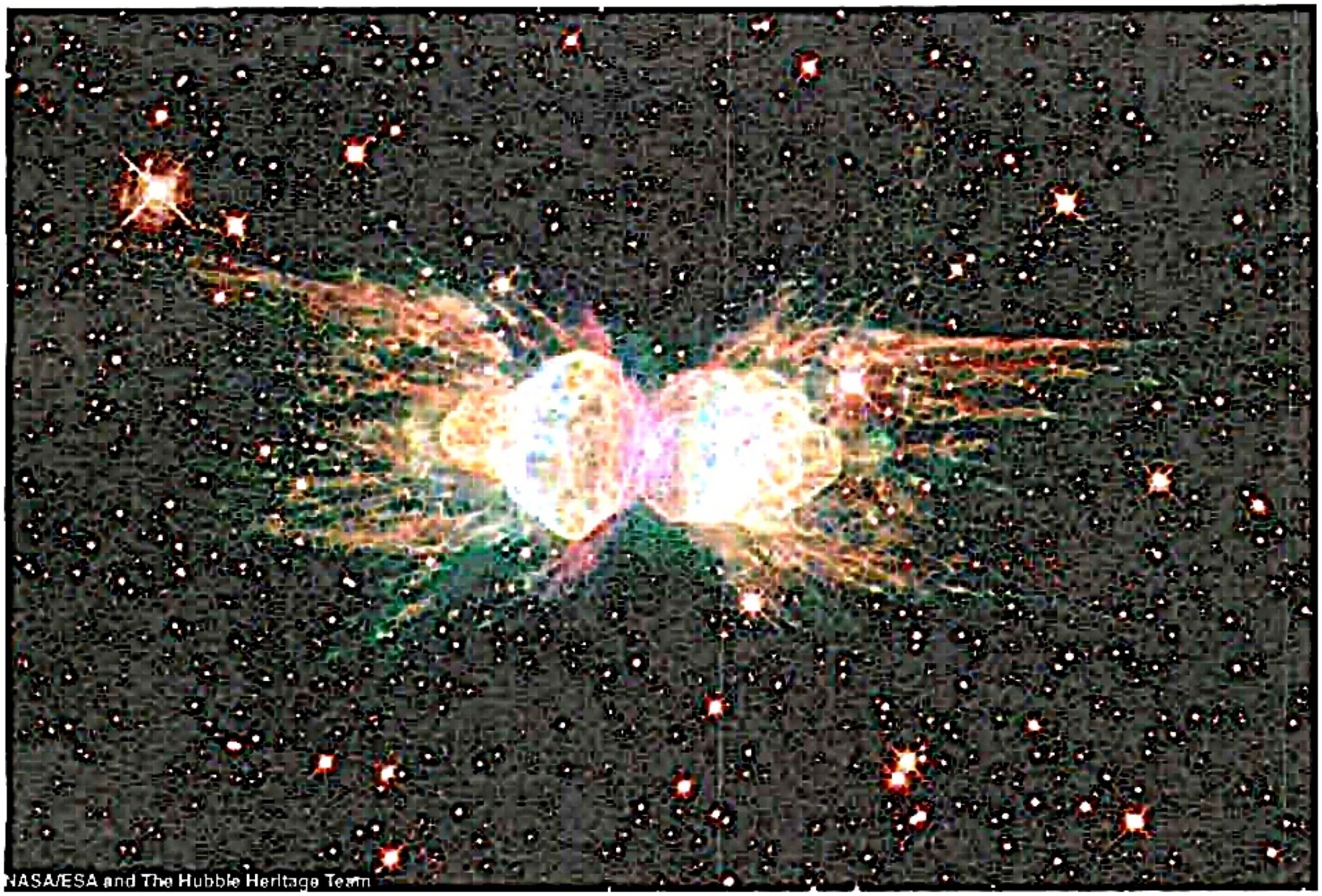


The Butterfly Nebula (M2-9)
—one of the most exquisite-looking hourglass plasmaspheres.
(Photograph courtesy of NASA.)

edge. Even so, from our distance here on Earth, as seen through Earth-based and space telescopes, it does come close to a distinct sphere.

This nebula has been described as marking the boundary between the intense wind of particles shed by its parent star and the denser material beyond its edge through which it is expanding. The bubble's surface has been explained as marking the leading edge of the stellar wind as it plows through the surrounding material.

Notice once again the restraint exhibited by astrophysicists in referring to this bubble as a plasmasphere. But, as Donald Scott clarified, the description of this bubble as "ionized gas



Menzel 3—the Ant Nebula
One of the most explosive-looking among the hourglass plasmaspheres.
(Photograph courtesy of NASA.)

pushed out by the stellar wind of the central star" makes the bubble's identity as a plasmasphere "fairly 'accepted'." According to him the Bubble is actually formed electrically, and may well be "an extremely active double layer outside the boundary of the star's spherical plasma (i.e., its heliopause)."[1] And so, likewise, Wallace Thornhill.[2]

That the sphere in question is electrically derived is given additional support by Anthony Peratt when he informs us that "the Bubble Nebula, its shape, radiation spectrum, and life evolution can be replicated with the use of electric currents."[3]

Thus, the Bubble Nebula is made visible precisely because it is expanding since this is constantly bringing it in contact with an area of space that is of a different electrical potential than that within its shell.

There is yet one more class of nebulae which exhibit tell-tale hourglass shapes that are found scattered throughout space at various angles as viewed from our terrestrial perspective.

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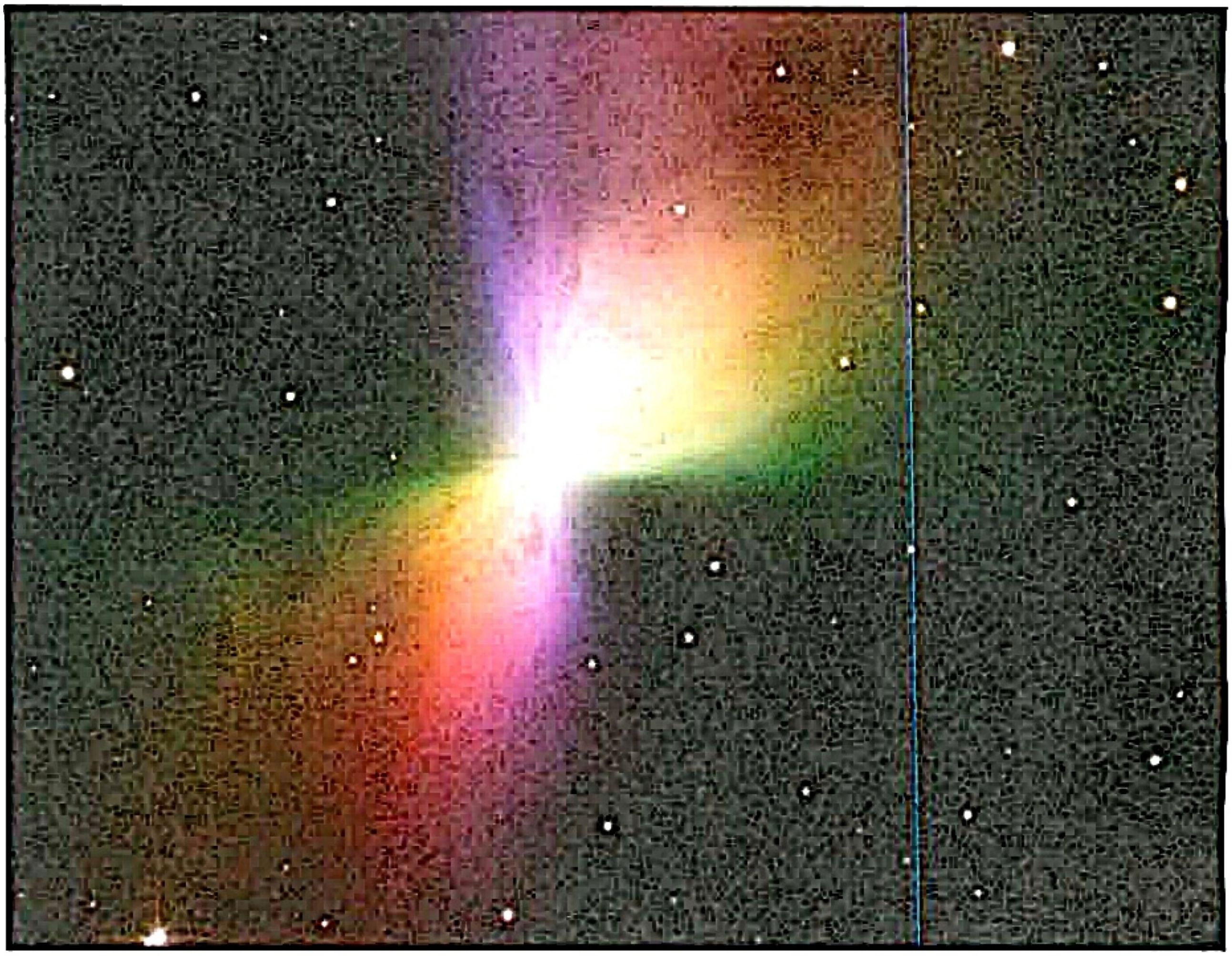
[1] D. E. Scott, on Intersect, private discussion group sponsored by KRONIA communication (May 14, 2006).

[2] W. Thornhill, *ibid.* (May 15, 2006).

[3] A. L. Peratt, *ibid.* (May 16, 2006).



The Boomerang Nebula, showing the distinctive Z-pinch at its central star.
(Photograph courtesy of NASA.)

Believed by some to be the final explosion stage of large stars, these nebulae failed to live up to their predicted spherical shapes. That these hourglass nebulae constitute plasmaspheric phenomena dominated by electrical discharges is betrayed by their characteristics: (1) the ultraviolet light shed by their central stars; (2) the twisted filaments within their structure; (3) the frequent nesting of these structures within one another; and (4) the comparable form they exhibit to plasma z-pinches.[1] These configurations constitute tubular plasma sheaths—which glow through their energetic discharges—stretched along the axes of their stars. Nested examples are double layered plasmas—with positive charges on one side and negative ones on the other. Strong electric fields subsist between the layers. These electrical currents tend to pinch into filaments which attract each other, usually in pairs, at long distances. But they also repel each other at short range. The filaments also twist around one another like a braided rope, creating the well known Birkeland currents we have earlier noted.[2]

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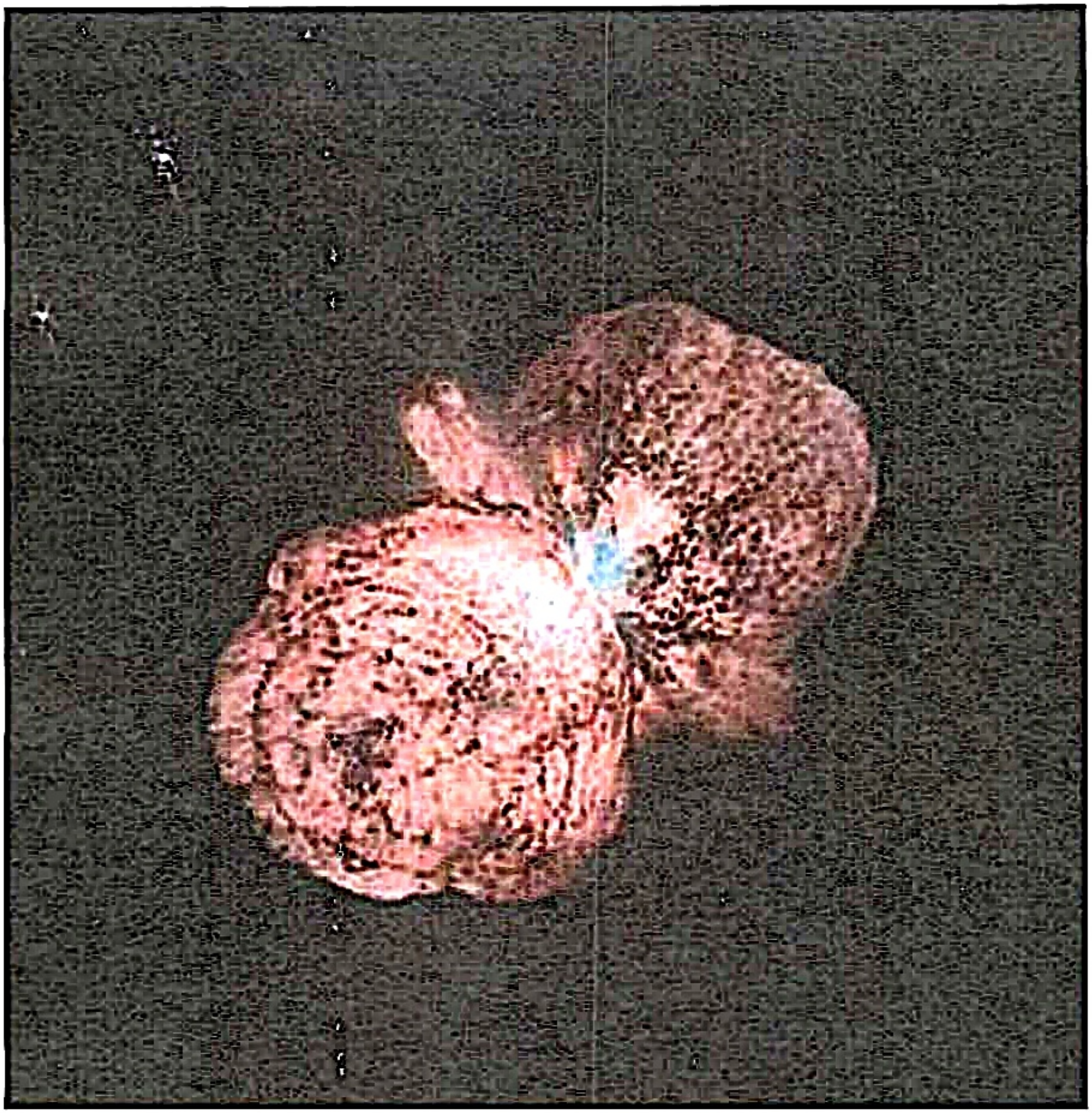
[1] See here, for example, D. Talbott & W. Thornhill, *Thunderbolts of the Gods* (Portland, Oregon, 2005), pp. 56-59.

[2] See also *God Star* and *Flare Star* (check Index to both under "Birkeland currents.")

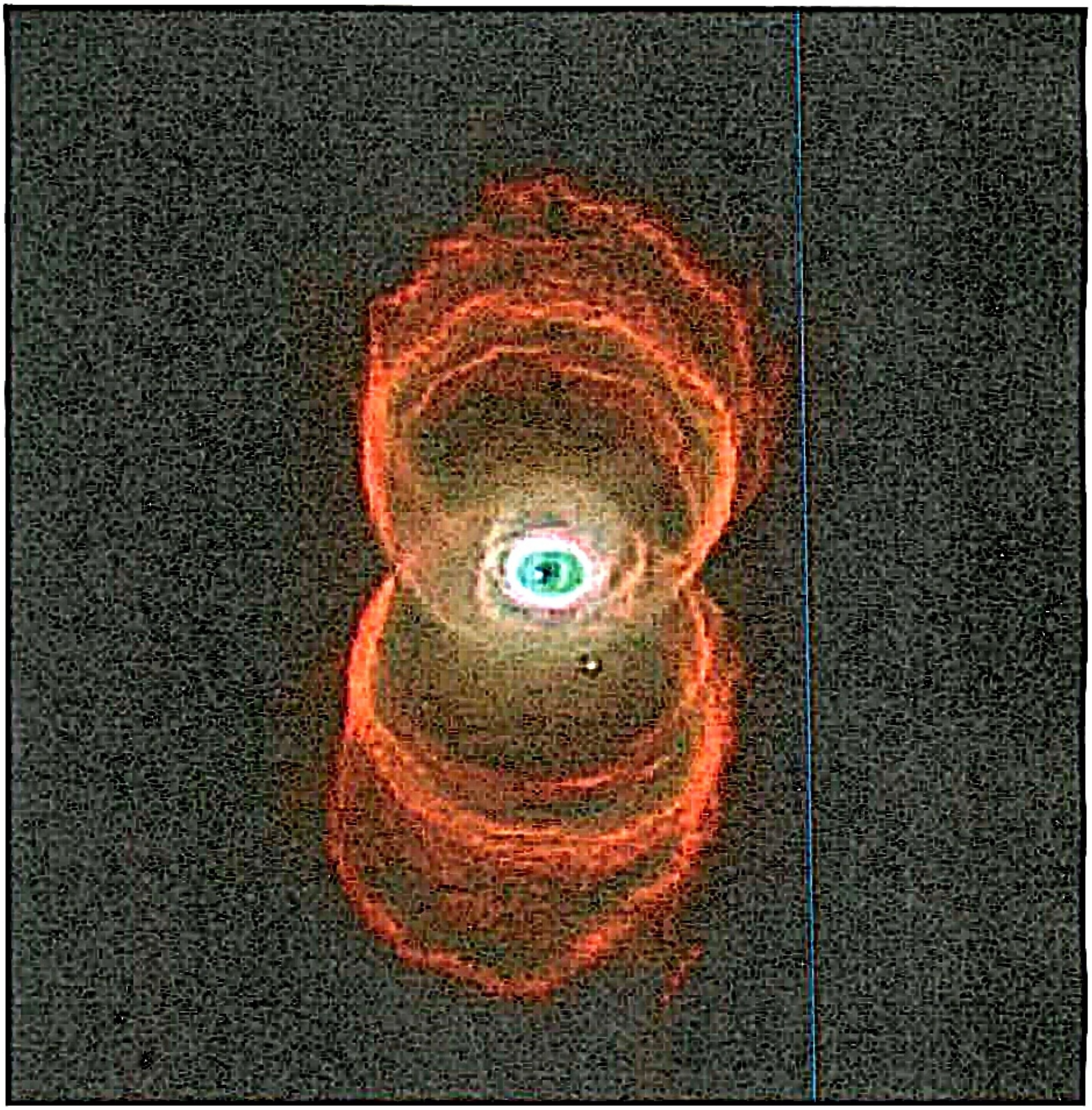


Eta Carinae—the hourglass nebula from an unstable star that is expected to go supernova sometime in the future.
(Photograph courtesy of NASA.)

RESOLVING THE ANTARCTIC DILEMMA

The question now becomes simply this: Which of these three types of sheaths constituted proto-Saturn's plasmasphere? At this late date it is difficult to say with certainty, but Wallace Thornhill opts for the hourglass type.[1] The reasoning behind his choice is simple enough. As already noted, the hourglass shape of these nebulae reveal the plasmatic z-pinches centered on

[1] W. Thornhill to D. Cardona, verbal communication at Portland, Oregon, June 16, 2006.



MyCn18—the aptly named Hourglass Nebula—
as seen obliquely from Earth's perspective.
(Photograph courtesy of NASA.)

the stars that generate them. In some cases, these creations are believed to be the result of the central stars' death throes. Thus, according to Anthony Peratt, "supernovae evolve according to the plasma pinch effect,"[1] which is what we see in these hourglass nebulae. A good example of this is Eta Carinae, the nebula of an unstable star that is expected to go supernova sometime in the future.[2]

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[1] A. L. Peratt, on the Intersect discussion group sponsored by KRONIA Communications (August 28, 2006).

[2] D. Talbott & W. Thornhill, *op. cit.*, p. 58

But stars are also *born* from such z-pinches. Hannes Alfvén, as well as others, had long insisted that "stars condense out of plasma" but "only when the electric current passing through the material exceeds a certain threshold."[1]

> "Then the plasma is 'pinched' and compressed to the point where gravitational collapse ensues."[2]

Focusing on a section of the Perseus molecular cloud complex, and heralded as having been "long predicted by theory," astrophysicists have more recently announced what they claimed to be "the first conclusive evidence of an hourglass-shaped magnetic field in a star formation region."[3] Stars are actively forming in this region—designated NGC 1333 IRAS 4A—through what has been described as "collapsing molecular cloud cores" which have been touted as "the seeds of star formation."[4] Such collapsing molecular cloud cores are better known to plasma cosmologists as plasma pinch effects, otherwise simply as z-pinches.

Thornhill therefore argues that, since stars seem to be born and die in, and due to, these pinches, "it seems reasonable to suggest that a star receives electrical energy from the galaxy in the form of a mild z-pinch throughout its entire life."[5]

As we have also noted above, the Sun's heliosphere, which is its plasmasphere, has turned out not to exhibit a spherical shape. Moreover, as Thornhill notes, the Sun seems to display what have been termed "open magnetic field lines" at high latitudes. Magnetic field lines, however, cannot be open. These field lines, according to Thornhill, "must be part of a much larger magnetic circuit." It thus "seems reasonable to suggest that the field lines connect to the hourglass-shaped galactic z-pinch of the Sun." And this pattern, Thornhill claims, has to be the same for all stars, including the one which once enveloped the proto-Saturnian sun.[6]

When it comes to the proto-Saturnian system, it is not reasonable to suppose that Earth was not itself encased in its own plasmasphere, which plasmasphere would have been contained within that of proto-Saturn. Just as it is at present, Earth's plasmasphere would also have been stretched due to proto-Saturn's sub-stellar wind. But while at present Earth's plasmasphere is extended equatorially, when still a member of the proto-Saturnian system it would have been elongated axially for the simple reason that *that* was the direction from which proto-Saturn's sub-stellar wind would have impacted on it. And although we have posited that proto-Saturn's plasmasphere must have been opaque, Earth's would have to have been transparent.[7] Had it not been so, the radiation reflected off the inner surface of proto-Saturn's own plasmasphere would not have been able to penetrate the one encasing Earth.

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[1] A. L. Peratt, "Plasma Cosmology," *Sky & Telescope* (February 1992), p. 141.

[2] *Ibid.*

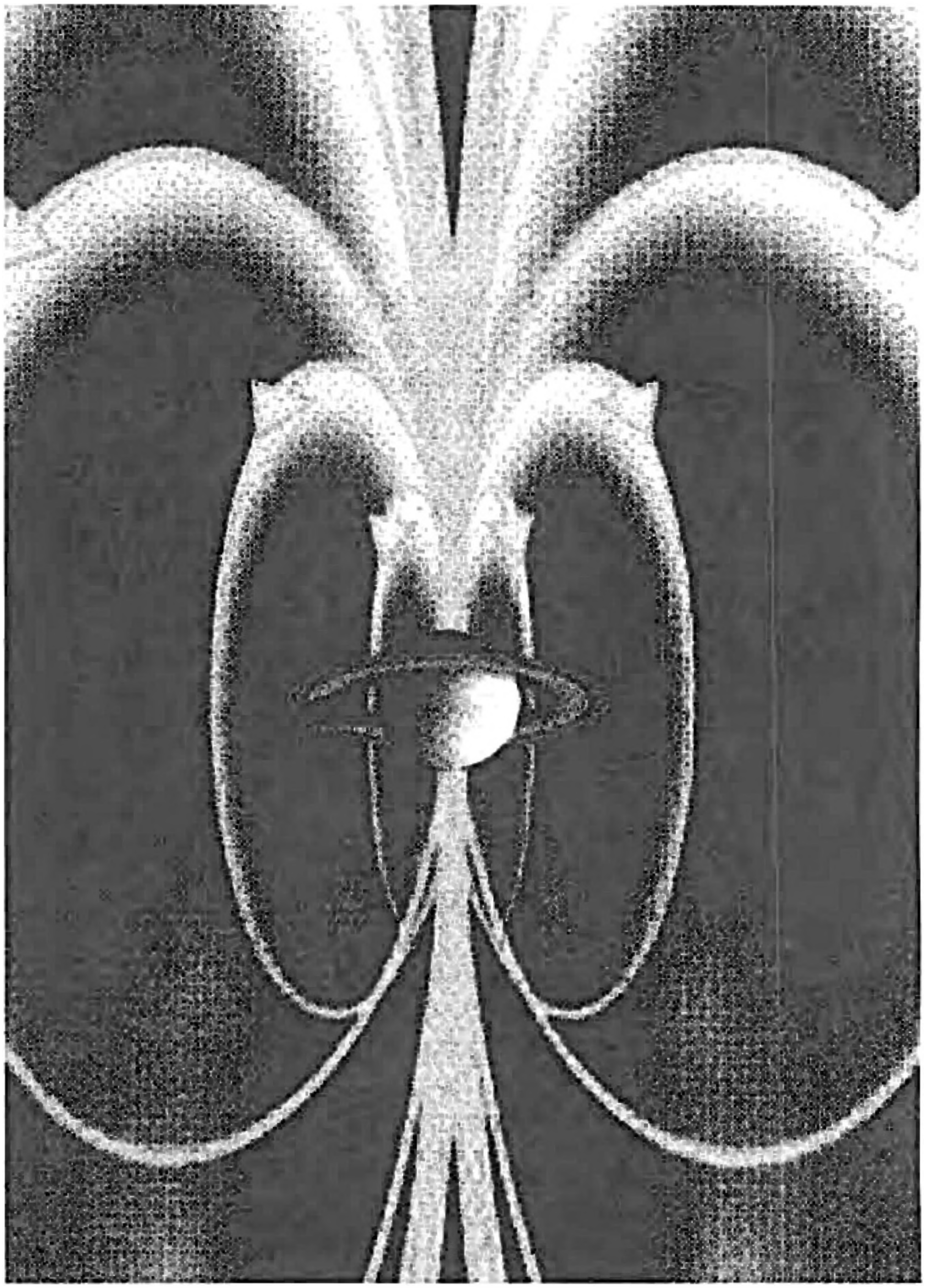
[3] "'Hourglass Figure' Points to Magnetic Field's Role in Star Formation," Harvard-Smithsonian Center for Astrophysics, Press Release No. 06-21 (August 10, 2006). NOTE: Following this date, the press release was somewhat altered without, however, changing its message.

[4] *Ibid.*

[5] W. Thornhill to D. Cardona, e-mail communication (July 13, 2006).

[6] *Ibid.*

[7] See back to p. 10, this work; but also *God Star*, pp. 297-303, 464; W. Thornhill & D. Talbott, *The Electric Universe* (Portland, Oregon, 2002/2007), p. 84.



Saturn's present magnetosphere.
(Simulation courtesy of NASA/JPL.)

If proto-Saturn's own plasmasphere exhibited an hourglass shape, it would have extended axially rather than equatorially in order to contain the axially-aligned Earth. As we have seen, such pinched and elongated sheaths *do* tend to be axially aligned. In such a configuration, which Thornhill favors, light and heat radiated off the inner surface of proto-Saturn's plasmasphere would have reached Earth's south polar region tangentially, very much in the same manner that the Sun's rays reach both Earth's polar regions at present. And, for the same reason, such slanted and/or weakened rays would not have been enough to warm Earth's southern pole. More importantly, proto-Saturn's axial sheath would not even have had a southern terminal from which to reflect back heat since, as can be judged by the photographs presented on the preceding pages, hourglass plasmaspheres are open ended. This is not to say that they are *magnetically* open ended, since magnetic field lines cannot remain open. The magnetic "lines," according to Thornhill, continue on "to join the threads of the galactic magnetic field."[1] As he adds:

> "...the magnetic field lines actually trace the current flow in the vicinity of the star. The current density near the star is higher than in nearby space so it is 'pinched at the waist' by its self-induced toroidal magnetic field."[2]

Under this scheme, the shadow cast on the Antarctic region by the southern toroidal oval, which played such an important part in the freezing of the northern hemisphere, would have added but little cold to the southern zone. Earth's southern pole would have received so little heat throughout the proto-Saturnian system's life that, in some cases, even the heat released by the recurring flare-ups would not have been enough to melt the ice completely since the amount of melting would have depended on the strength of each individual flare-up. Granted that, as we have seen, some of the lengthy interims following flare-ups would have warmed enough to allow forests and animals to thrive, such a state could not have ensued following each and every flare-up. This complex state of affairs goes a long way in explaining why Antarctic ice commenced to melt later, and much slower, at the end of the Pleistocene Ice Age than its northern equivalent, which would have received the full impact of proto-Saturn's flare-up directly from above. The reason why it never completely disappeared has to do with what transpired some five thousand years later when even Earth's *north* polar cap did finally freeze—but, as in other matters, that, too, will have to wait for the continuation of our story to be told in future volumes of this series.[3]

EARTH'S DUSTY BURDEN

That cosmic dust plays an important role in the formation of stars and planets has been known for quite some time. Back in the 1960s, Lyman Spitzer had surmised that "dust forms

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[1] W. Thornhill to D. Cardona, e-mail communication (July 26, 2006).

[2] *Ibid.*

[3] But see also D. Cardona, "The Demands of the Saturnian Configuration Theory," *AEON* VI:1 (February 2001), pp. 69 ff.

over hundreds of millions of years as individual atoms occasionally collide in interstellar space."[1] But infrared radiation stemming from stars detected by the IRAS satellite in the 1980s convinced astrophysicists that dust grains grow much more quickly over timescales spanning *just a few decades*.[2]

It is also now known that most, if not all, of the plasmatic disks that surround some stars, as in the case of Beta Pictoris, are laden with dust.[3] And if dust can be collected by such disks in a matter of decades, the accumulation of dust by proto-Saturn's circumstellar cloud and Earth's toroidal ovals during interglacial periods cannot be considered out of the question.

Dust has also been assumed, although not yet quite verified, to be dispelled in quantities by supernovae explosions.[4] If that is the case, during its recurring flare-ups, the proto-Saturnian sun would also have scattered cosmic dust in vast quantities.

As weak as gravity is in relation to electromagnetic forces, it still exists. It is therefore further stipulated that some of the dust gathered up by Earth's polar toroids, to say nothing of what had remained free in the atmosphere itself, would have fallen victim to its attraction. A fair amount of dust should therefore have fallen with the snow during the Pleistocene. Some of this dust should still be there, mixed with whatever ice did not completely disappear at the end of the Ice Age. In the northern hemisphere, such ice continues to exist in parts of Greenland. This, therefore, constitutes one more test that our theory has to meet. Has such fossil dust, if I may call it so, ever been found?

In fact, ice cores retrieved from Greenland contain as much as 100 times more dust in Pleistocene ice than in later ice.[5] "These whiffs of ancient air," as one writer has called the evidence of these cores, "reveal that the Ice Age atmosphere had a low content of carbon dioxide—a gas that enables the atmosphere to retain the warmth of the sun—and a heavy burden of sunlight-screening dust, some of it volcanic."[6] What Pleistocene dust managed to screen, however, was not sunlight, but proto-Saturn's luminosity. Moreover, that most of this dust was of cosmic origin, rather than volcanic, has also been ascertained.[7]

According to our reconstruction of events, cosmic dust on Earth should be much more concentrated at the poles. And, once again, our theory finds support for this. Sediment which has been retrieved from a lake in Greenland was as much as 1,000 times richer in cosmic dust than that of the best-known deep-sea deposits.[8] "Furthermore, geological evidence suggests that the particles are only a few thousand years old, while those on the ocean bottom are typically over 10,000 years old."[9] What we are being told here is that, while cosmic dust falls all

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[1] "The Quest for Dust," *New Scientist* (June 17-23, 2006), p. 18.

[2] *Ibid.*

[3] C. Kitchin, "Dust Bunnies are Planet Fluff," *Astronomy Now* (June 2006), p. 10.

[4] *Ibid.*; S. Clark, "Hot on the Trail of Stardust Missing Since Time Began," in *ibid.*, p. 18.

[5] C. U. Hammer, *et al.*, "Continuous Impurity Analysis Along the Dye 3 Deep Core," *American Geophysical Union Monograph* , 33 (1985), p. 90.

[6] W. Chorlton, *Ice Ages* (Alexandria, Virginia, 1983), p. 110.

[7] P. A. La Violette, "Evidence of High Cosmic Dust Concentration in Late Pleistocene Polar Ice (20,000-14,000 years B.P.)," *Meteoritics*, 20 (1985), pp. 545 and elsewhere; see also the *New York Times* (September 1, 1987).

[8] *Sky & Telescope* (April 1987), pp. 367-368.

[9] *Ibid.*

over the world, most of that in the northern hemisphere is much more concentrated. Nor had this always been the case. As it has been estimated, the amount of dust in the air changed by a factor of ten.[1] "Furthermore," as Gino Segrè informs us, "these changes occurred quickly, in decades, and sometimes in as little as a few years."[2] And keep in mind that while we have indicated a certain amount of doubt concerning the various age estimates applied to ice cores, what we are here reporting falls within the 10,000 year bracket which has been determined to be "the practical limit" for the dating of deep ice.[3]

Moreover, the boundary between the dusty ice of the Pleistocene and that of the following Holocene is abrupt,[4] which indicates that the fall of dust ended swiftly, with very little dust falling once the Ice Age had come to a sudden end.

Why would this have been so? Should not more dust have fallen once proto-Saturn's flare-up dispersed its circumstellar disk and Earth's auroral ovals? In fact, given all the above, why do Earth's *present* auroral toroids not contain such material? How come they did not manage to pick up enough dust from what was dispersed by the flare-up to start a new ice age?

The answer is that there is at present very little loose material in Earth's vicinity for its auroral toroids to collect. And why so? Because, following the flare-up which occurred during the Pleistocene, bringing that epoch to an abrupt end, the proto-Saturnian system had entered into an entirely new spatial zone dominated by a much more energetic stellar body. Despite the amount of material that must have been dispelled by proto-Saturn's flare-up, the system's plasmasphere fell subject to our present Sun's greater electrical potential. Although it did not happen all at once, in turn this resulted in the drastic transformation and weakening of proto-Saturn's plasmasphere and, with it, the loss of most loose material in Earth's vicinity.

Needless to say, Earth's electrical environment also changed. Although proto-Saturn's previous electrical energy would have been less powerful than the present Sun's, one must not loose sight of our oft-repeated dictum concerning the former proximity of the proto-Saturnian sun to Earth. In such a relatively restricted configuration, Earth would have been immersed in a much higher electrical environment than at present. At higher electrical potential, any plasmatic toroids encircling Earth would themselves have been more energetically charged. Their tendency to collect loose material would have been high.

THE TELL-TALE SIGNATURE

As with the Cretaceous-Tertiary boundary stratum, ice core samples from Camp Century in Greenland were found to contain high iridium levels the deposition rates of which would have been from 10 to 60 times greater than what is normally possible on Earth.[5] This caused Paul La Violette to rule out terrestrial volcanism, but also asteroids and comets since particles

[1] G. Segrè, *A Matter of Degrees* (N. Y., 2002), p. 103.

[2] *Ibid.*, p. 104.

[3] S. Mewhinney, *Ice Cores and Common Sense* (April 1989), p. 45.

[4] W. Dansgaard, *et al.*, "The Abrupt Termination of the Younger Dryas Climate Event," *Nature*, 339 (1989), p. 532.

[5] V. Clube & B. Napier, *The Cosmic Winter* (Cambridge, 1990), pp. 269-270.

from these sources would at best have remained in Earth's atmosphere for about a year and not for the 6,000 years or so indicated by the ice core evidence.[1] Although the ice containing this iridium has been dated to the late Pleistocene, the 6,000-year stretch was derived from the 20,000- to 14,000-year-old levels in the ice. According to this dating, the fall of iridium would have predated proto-Saturn's flare-up. But while the content of the ice is incontestable, estimates derived from it are certainly not. On the contrary, as we have seen, Zbigniew Jaworowski's professional conclusion is that ice cores do not provide a reliable measurement of anything. In fact, he has actually accused those who have derived such evidence from ice cores of having fudged the data through their ignorance concerning the physical processes through which glacial ice is formed.[2]

Since, however, the *content* of the ice cannot be disputed, La Violette has stressed that if the material in question is of extraterrestrial origin, it would have had to come from a body, or bodies, which would have been entirely different from that of the majority of meteorites or comets. In fact, the overabundance of the iridium seems much in keeping with stellar—or, in our case, sub-stellar—flare-ups.

IN CONCLUSION

What we have presented above concerning the manner in which ice ages came about constitutes a theory that will require further corroboration. There is no doubt that various objections will be raised against it, as they will also be raised against the rest of this work. That, after all, is often the fate of newly devised theories. Eberhard Zangger knew exactly what he was talking about when he stated that "there is no absolutely *objective* method of judging the validity of a theory."[3] And "one can ask various experts for their opinion," he went on, "but even they often have difficulty in recognizing the worth of revolutionary innovations, *especially when these diametrically oppose the prevailing interpretation.*"[4] One could also take comfort in the belief that "if a theorist doesn't turn out to be wrong at least 50 percent of the time, he isn't being creative enough."[5] But why use crutches when not needed? The only thing I will stress is that even if our theory of ice ages turns out to be erroneous, it will not invalidate the proto-Saturnian scenario we have been reconstructing.

What our theory of ice ages has in its favor is the solution of various dilemmas which previous hypotheses failed to solve. We could have included other anomalies that have burdened prior theories which are easily resolved by the model we have proposed. Take, for instance, the rapid climate changes that have been posited to have occurred during the last Ice Age. As determined by ice core samples, "the average temperature was much lower than it is today, but it was also subject to large, abrupt fluctuations that sometimes lasted for centuries."[6] What

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[1] P. A. La Violette, "Evidence of High Cosmic Dust Concentration in Late Pleistocene Ice (20,000-14,000 Years B.P.), *Meteorics*, 20 (1985), p. 545.

[2] Z. Jaworowski, "Ice Core Data Show No Carbon Dioxide Increase," *21st Century* (Spring 1997), pp. 42-52.

[3] E. Zangger, *The Future of the Past* (London, 2001), p. 179 (emphasis as given).

[4] *Ibid.* (emphasis added).

[5] M. D. Lemonick, "Before the Big Bang," *Discover* (February 2004), p. 39.

[6] W. H. Calvin, "Climate Ups and Downs," *Scientific American* (September 19, 2006, Special Edition), p. 87.

is then perhaps redundant to note is that the temperature of the last 10,000 years has been relatively even.[1] But under the orthodox scheme, especially that dictated by the Milankovitch cycles, this is believed to have been abnormal.[2] But it is not by any means odd under the scheme presented here. The reason is simple enough since it was only at the termination of the Ice Age that Earth was drawn into the relative stability of our present solar warmth.

But we are still left with some minor brainteasers. What, for instance, would have caused the above-mentioned fluctuations in temperature *during* the Ice Age under our postulated scheme? Could proto-Saturn's periodic display of spots, far larger than those developed by our present Sun, which would have caused it to dim slightly,[3] have been responsible for this? Although Manoj Joshi does not believe that the ensuing cold from this would have precipitated "the big freeze,"[4] it might have been enough to account for Earth's irregular temperature *during* ice age spans.

And what can one make of the abundance of precious stones that litter the Arctic region? We have seen in our previous work that micro-diamonds, and perhaps even some which were more substantial, might have rained out of the sky.[5] But sapphires, emeralds, and rubies, too? Emeralds are found in the Yukon, sapphires on Baffin Island. "You want rubies?" asked Anne Casselman. "Go to Greenland."[6]And, no, I am not referring to gems that are mined out of the land. I am talking about stones that are sprinkled on the surface. "There are rubies on the surface everywhere," says Andrew Lee Smith, the head of True North Gems, Canada's leading gemstone exploration company. "I mean, you can't set foot anywhere without stepping on five or six rubies."[7] Did these rubies also fall out of the sky? The reader may laugh at such a suggestion—and do keep in mind that I am not really suggesting it. But remember, also, that there was a time when the belief in larger stones falling from the sky was also laughed at by astronomers. In the end we will have to concede that, when it comes to certain details, we will never know the truth—at least not in its entirety—as Richard Fortey well illustrates. "Cambrian, Ordovician, Silurian, and so on, up the geological column," he wrote, "each of these again subdivided finely and more finely, the better to approximate history."[8]

> "It is an astonishing story [he went on], a tale of more than 3,500 million years. Consider what has happened since the death of Napoleon: the interpretations, the parade of historical facts, the controversies; and it will be obvious that a history more than ten million times as long can never be known, even in outline."[9]

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[1] G. Segrè, *loc. cit.*

[2] *Ibid.*

[3] That red dwarf stars develop such immense spots, causing them to dim slightly, on a periodic basis has long been known. See K. Croswell, "Red, Willing and Able," *New Scientist* (January 27, 2001), pp. 30-31,

[4] *Ibid.*

[5] *Flare Star*, pp. 430 ff.

[6] A. Casselman, "The Rubies of Winter," *Discover* (December 2005), p. 10.

[7] *Ibid.*

[8] R. Fortey, *Life: A Natural History of the First Four Billion Years of Life on Earth* (N. Y., 1998), p. 11.

[9] *Ibid.*

It's even worse when it comes to the history of our Sun's present planetary family, since every new discovery serves to show us how little we know and how much in error that little is.

> "Our view of the solar system [Alan Stern recently reported] has been radically transformed...The Kuiper belt is the largest structure in the planetary solar system. It's where most of the planets are, where most of the organic chemicals are, where double planets and other exotic things are. We never had a clue about that. When I was going to school, Pluto was a misfit. Now it looks like Earth is the misfit."[1]

"We've only known about the Kuiper belt for a short time," says the Yale University astronomer David Rabinowitz, "and we know next to nothing about how the solar system formed."[2]

When it comes to catastrophism, so much derided during most of the twentieth century, I can do no better than repeat the words of Stephen Jay Gould:

> "The world of the new catastrophism—with its rapid, quirky, unpredictable, and unrepeatable changes—may offer less solace than the comfort provided by gradualistic continuity and insensible transition toward predictable ends. But nature does not exist to provide such geologic latecomers as ourselves with philosophical comfort. We need solace but can only find it within our hearts. I would rather have fascinating answers and challenging themes from nature."[3]

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[1] F. Guterl, "Journey to the Outer Limits," *Discover* (March 2006), p. 53.

[2] S. Kruglinski, "EL61, A Space Oddity," *Discover* (December 2005), p. 10.

[3] S. J. Gould, "An Asteroid to Die For," *Discover* (October 1989), p. 65.

Epilogue

LIFE'S ORIGIN

We've covered a lot of ground in the past pages of this work and, while covering that ground, new discoveries kept adding to the ground we have been covering. Not only that, but some of the enigmatic hypotheses we have made use of in these past pages continue to be upheld by newer authorities. Among such is the belief that the Sun "was some 30 percent dimmer," thus "providing less heat to Earth," at the time life *rose* on Earth.[1] This led Stanley Miller to conduct some experiments during a twenty-five year period, the results of which led him to propose that life on Earth might have evolved from *frozen* mixtures of ammonia and cyanide.[2]

Others, however, have been claiming that at least some of the crucial ingredients required for the inception of terrestrial life may have actually formed in interstellar space. And while this hypothesis can be traced to the Greek philosopher Anaxagoras who lived sometime in the 5th century B.C., it did not quite catch on until the late 1800s with William Thomson[3] plus the Swedish chemist Svante Arrhenius a few decades after him.[4] Known as panspermia, the premise had no difficulty in infiltrating the twenty-first century.[5]

As recently preached, these potential life-bearing ingredients could have sprinkled onto planets as they traveled with their host stars through the galaxy.[6] But even the supposition that such organic molecules might have been dumped on Earth by comets, as proposed in the early 1960s by biochemist John Oró,[7] continued to be bandied by still others[8]—all of which gained additional prominence while the finishing touches were being applied to this very epilogue.[9] This ensued from the contents of two meteorites that were discovered in Antarctica in 1992 and 1995. What sparked renewed interest in these space rocks were the concentrations of amino acids embedded in them. As reported by the staff of *Space.com*, and as noted earlier in this very work, amino acids are "organic molecules that form the backbone of proteins, which in turn build many of the structures and drive many of the chemical reactions inside living cells."[10] This led to the realization that the early Solar System was "far richer in the organic building blocks of life than scientists had thought."[11] It has therefore been theorized that the

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[1] D. Fox, "Did Life Begin in Ice?" *Discover* (February 2008), p. 57.

[2] *Ibid.*, pp. 52 ff.

[3] N. Calder, *The Comet is Coming!* (N. Y., 1980), p. 104.

[4] V. A. Firsoff, *Life, Mind and Galaxies* (Edinburgh, 1967), p. 32.

[5] See, for instance, B. Dorminey, "Did Molecules from Space Seed Life in the Cosmos?" *Astronomy* (April 2008), pp. 50 ff.

[6] D. Mosher, "Life's Ingredients May Have 'Sprinkled' on Earth," *Space.com* (September 11, 2007).

[7] T. Dickinson, "The Seeds of Life," *Equinox* (July 1997), p. 65.

[8] C. O. Choi, "The Enduring Mysteries of the Outer Solar System," *Space.com* (December 31, 2007).

[9] "Space Rocks Brought Life's Raw Material," *Space.com* (March 13, 2008).

[10] *Ibid.*

[11] *Ibid.*

meteorites in question came from a shattered asteroid,[1] although the previous supposition that comets, too, might have rained such material onto the primitive Earth continued to be upheld.[2]

What was also *not* discarded was the assumption that "other chemical precursors" of life could have come from the interstellar medium.[3] And that, according to our developing reconstruction of past events, is really where most of these relatively puny bodies—comets, asteroids, and meteorites—would have received their burden of organic molecules in the first place. It is therefore not the least bit surprising that such ingredients are now believed by some to coat the surfaces of quite a few of the bodies orbiting within Earth's Kuiper belt.[4]

Terrestrial impacts, whether thought to be cometary, asteroidal, or meteoric, are now considered to have been from 25 to 30 times more frequent around the time when life rose on Earth,[5] or slightly before that.[6] "Pinning down when these impacts occurred," according to Bernard Foing of the European Space Agency, "could help shed light on whether they scoured primitive life that had just developed on Earth—or whether they planted chemical ingredients that helped life emerge."[7]

Regardless of whether they came from outside Earth or not, the energetic constituents that continued to be held responsible for animating these ancestral molecules into life-bearing organisms was that form of electrical discharge known as lightning. This even led to the retraction of an erroneous exposition by its very promoter, professor of chemistry Homer Jacobson, who had originally appeared quite adamant against the probability of there having been enough "time and space available for the origin of terrestrial life."[8] His retraction earned him the praise of having "responded in the noblest tradition of science,"[9] even though it took more than half a century for him to withdraw his erroneous declarations. While the length of time this took is really immaterial, it is the admitted motivation behind his withdrawal that bothers this particular researcher. While Jacobson himself was honest enough to admit that retraction "this untimely" is not normally undertaken, the reason he gave for his disclaimer was the "irresponsible" use of his erroneous claims by contemporary Creationists.[10] "I am deeply embarrassed to have been the originator of such misstatements," he wrote, "allowing bad science to have come into the purview of those who use it for anti-scien[tific] ends."[11] But should that have been the only, or prime, reason to retract? What if Creationists had never utilized his work in support of theirs? Would it have been less embarrassing to have had his faulty scientific work find its way into college and/or university textbooks? And then, was his

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[1] *Ibid.*

[2] *Ibid.*

[3] *Ibid.*

[4] C. O. Choi, *op. cit.*

[5] *Idem*, "The Enduring Mysteries of the Moon," *Space.com* (September 17, 2007); D. Fox, *loc. cit.*

[6] D. Fox, *loc. cit.*

[7] C. O. Choi, *loc. cit*

[8] H. Jacobson, "Information, Reproduction and the Origin of Life," *American Scientist* (January 1955), p. 125, but see also p. 121.

[9] D. Schoonmaker, "The Scientist's Red Pencil," *American Scientist* (November-December 2007), p. 466.

[10] H. Jacobson, "No Time Like the Present," in *ibid.*, p. 468.

[11] *Ibid.*

retraction even based on some new discovery? Among the "elements" that "could have existed under early Earth conditions" that he now believed *could* have led to the origin of life were the very "electrical discharges"[1]—that is lightning—that was proposed even earlier than his original work by Harold Urey in 1953.[2]

INTERPLANETARY DISCHARGES

As we noted on an earlier page, some of the impacts that have scarred our world might not even have been caused by the fall of physical bodies. They might, instead, have been the result of electrical discharges in the form of colossal lightning. And while, as we said, such scars are found in a spread before, within, and after extinction boundaries, it does not take much wondering to realize that emissions on this scale would surely have aided in the creation of life. If ordinary terrestrial lightning is believed to have been responsible for the activation of organic molecules into life-bearing amino acids, can one imagine what interplanetary discharges could have accomplished? But is there any evidence that lightning can actually bridge the gap between celestial bodies?

That the gods of ancient man were wont to hurl thunderbolts at mankind and even at each other for whatever reason they believed to have been necessary for the preservation of their divinity, should be known to anyone who is even slightly familiar with mythology. "Thunder," Mircea Eliade tells us, "was from the beginning, and still is, the essential attribute of the sky gods."[3] But if, as we believe,[4] man's ancient gods were the anthropomorphized planets, the casting of their thunderbolts would translate into the interplanetary discharges we are presently discussing.

An electric spark bridging the distance between planets was not something the scientific establishment was about to honor with its blessings when Immanuel Velikovsky proposed it in the early 1950s.[5] Anything that was based on mythology was not then, or even now, about to receive the official stamp of scientific recognition. Faced with numerous ancient texts that devote prominent passages to the hurling of divine thunderbolts, modern authorities have understandably attempted to play down their role, believing the idea to have been inspired by the awe that terrestrial thunderstorms would have evoked in primitive communities.[6]

And then, as described by the ancients, some of the thunderbolts said to have been cast by divinities do not conform to what we usually understand as thunderbolts.[7] Others bear too

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[1] *Ibid.*

[2] "Genesis by Lightning," *Scientific American* (July 2003), p. 16.

[3] M. Eliade, *Patterns in Comparative Religion* (London, 1996), p. 53.

[4] See here especially *God Star*, pp. 51 ff.

[5] I. Velikovsky, *Worlds in Collision* (N. Y., 1952), p. 372.

[6] See for instance, H. R. Davidson, "Thor's Hammer," *Folklore* 76 (1965), p. 1, as quoted by E. Cochrane, "Thundergods and Thunderbolts," *AEON* VI:1 (February 2001), p. 95.

[7] Those interested, however, can pursue E. Cochrane, *op. cit.*, *in toto*, as well as D. Talbott & W. Thornhill, *Thunderbolts of the Gods* (Portland, Oregon, 2005).

much of a similarity to the fall of meteorites not to be understood as such.[1] Quite a few, however, compare favorably with what we know of lightning. And if Melvin Cook,[2] Robert Bass,[3] and Wallace Thornhill,[4] among others, are correct, electrically charged cosmic bodies provide the answer.

The question then comes down to whether cosmic bodies are, or are not, electrically charged. As was made clear by some of the presenters at the international conference sponsored by the Institute of Electrical and Electronics Engineers in June of 2006, "unacknowledged evidence accumulated through the space age makes clear that planets *are* charged bodies."[5] It then follows that "[u]nstable motions within the electric field of the Sun, or motions bringing planets into close encounters, would lead to devastating electric discharge events."[6] As Thornhill adds:

> "When planets and moons are close enough...violent form[s] of charge exchange may occur. It is then that the apocalyptic weapon of the planetary gods is unleashed—the interplanetary thunderbolt."[7]

That electrical discharges can be of planetary proportions and able to bridge the gap between celestial bodies is evidenced by the crackling bolts that pass between Jupiter and its satellite Io.[8] And that craters can be excavated by interplanetary discharges has also been exemplified, especially with respect to Jupiter's outermost Galilean moon, Callisto.[9]

When it comes to the planet Saturn, lightning bolts in its atmosphere have been found to be "1,000 times stronger than anything seen on Earth."[10] More importantly, electrical discharges also take place within its system of rings as well as between it and its satellite Dione.[11] That being the case, one can more easily understand how Saturn's earlier more energetic proto-planetary sub-stellar emissions would have spanned the comparative distance that divorced it from Earth during the time period covered in the present work.

That the Saturnian planetary deity was wont to cast thunderbolts is described in various ancient texts—and in a future volume I will have much more to say about that. Here I will merely mention in passing that the Babylonian Ninurta, one of the earliest Saturnian deities,[12]

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[1] V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), pp. 174-175.

[2] M. A. Cook, *The Science of High Explosives* (N. Y., 1971), pp. 420-426.

[3] R. W. Bass, "The Celestial Dynamics of 'Worlds in Collision'," *S.I.S. Review* VI:1-3 (1982), pp. 74-75.

[4] W. Thornhill, "New Physics Supports Planetary Catastrophism," *Chronology & Catastrophism Review* (1998:2), p. 13.

[5] D. Talbott, *et al.*, *Electrical Scarring of Planets and Moons* (Portland, Oregon, 2006), p. 5 (emphasis added).

[6] *Ibid.*

[7] W. Thornhill, *loc. cit.*

[8] J. M. McCanney, "The Nature and Origin of Comets and the Evolution of Celestial Bodies," Part I, *KRONOS* IX:1 (Fall 1983), p. 20.

[9] *Ibid.*, Part II, *KRONOS* IX:3 (Summer 1984), pp. 68, 79.

[10] F. Reddy, "Cassini Spots Saturn Storm," *Astronomy* (June 2006), p. 28.

[11] J. M. McCanney, *op. cit.*, Part I, *KRONOS* IX:1 (Fall 1983), p. 34.

[12] D. A. Mackenzie, *Myths of Babylonia and Assyria* (London, 1915), reprinted as *Mythology of the Babylonian People* (London, 1996), p. 301; but see also *God Star* pp. 62, 124, 125 ff., 126, 128 ff., 131, 212-213, 240, 449.

The thundering Ninurta.

was depicted in the ancient temple dedicated to him with thunderbolts in both his hands. But, god aside, that thunderbolts from the *planet* Saturn slammed into Earth was not hidden from our ancestors' collective memory. The ancient Greeks were among many in antiquity who still remembered that the *planet* Saturn had more than once cast its thunderbolts at Earth,[1] as so did the Etruscans,[2] the Romans after them,[3] and, later still, the Incas half a world away.[4] There is no way in which these ancient peoples, among others, could have known about this particular phenomenon had their ancestors not witnessed it with their own eyes and passed the memory on. Such an event could not have been experienced—nay, it could never have occurred—had Saturn, or its proto-planetary progenitor, not been close enough to Earth to permit such an occurrence. Nor would there have been any reason for our ancestors to invent such a postulate, and to then repeat it half a world away. And although these thunderbolts flashed between the proto-Saturnian sun and our world on more than one chaotic occasion, it is their tremendous discharges in Earth's primordial youth that, in our opinion, were responsible for the activation of terrestrial life.

EVOLUTIONARY MUTATIONS

Electrical discharges from our proto-Saturnian sun were not only responsible for the inception of life, they were also the primary movers behind evolution. And while, because of its complexity, this is a subject we have purposely avoided in the foregoing pages, it would not be amiss to touch upon some of its aspects before we end this work.

There has been more than one authority in the past who has insisted that evolution progressed much faster than most paleontologists had normally assumed. There are even those who have questioned the lessons that were supposedly learned from the very forms of life on the Galapagos Islands that so impressed Darwin—some say even inspired him to formulate his theory of evolution.[5] Not only have the age of the islands themselves been revised downward, newer studies have indicated that, with the exception of the iguanas, the species they harbor have evolved "with surprising speed."[6] But even then, we are still talking about an evolutionary clock that is claimed to tick through millions of years.[7] So, likewise, Niles Eldridge:

> "Our theory [that is, his and Stephen Jay Gould's] is based on the observation that new species seem to appear suddenly and then to hang on for five to ten billion years without change. So it is reasonable to assume that change takes place *over a few thousand years*—in a spurt—not over billions of years."[8]

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[1] Seneca, *Quaestiones Naturales*, VII:4:2.

[2] G. Dennis, *The Cities and Cemeteries of Etruria*, Vol. I (London), p. 32.

[3] Pliny (Gaius Plinius Secundus), *Historiae Naturalis*, II:18:82 & 53:138.

[4] J. Sammer, "The Cosmology of Tawantinsuyu," *KRONOX* IX: 2 (Winter 1984), p. 26.

[5] T. Yulsman, "The Evolution Express," *Science Digest* (October 1985), p. 20.

[6] *Ibid.*

[7] *Ibid.*

[8] D. Ingber, "Challenging Darwin," *Science Digest* (December 1981), p. 86 (emphasis added).

Evidence that evolution can move much faster than that—almost instantly, in fact—was presented in 1982 when the unique kangaroos that inhabit the Hawaiian island of Oahu caught the interest of the "continent-hopping field biologist" James Lazell, Jr.[1]

Kangaroos in Hawaii? Well, yes, but they did not originate there. They are actually the descendants of a pair of Australian wallabies that escaped from a Hawaiian zoo in 1916. Just a few generations old, these Kalihi rock wallabies, as they have become known, which now number several hundred, have been found to make up an entirely new species. How did this come about? The "creatures' physiology," according to Lazell, "might simply be the result of remarkably rapid evolution."[2]

> "Those wallabies who were smaller and lighter in color—and thus better suited to the Hawaiian environment—would have a better chance at survival and reproduction. If the latter is the case, the wallabies' adaptation to their new environment was not only swift but extraordinarily thorough. Lazell reports that not only did the animals' external appearance change, so did the amino acid structure of at least one of their liver enzymes, which would have helped them safely feed on otherwise toxic plants on Oahu."[3]

Another radical in this field is Aaron Filler, a student of Ernst Mayr and Stepehn Gould, who likewise holds that entirely new forms of organisms came into being through sudden abrupt changes. He has even gone out on one of the slimmest biological limbs in advocating that humans, too, emerged abruptly; that they did so far earlier than previously believed; and that apes descended later, rather than the other way around.[4]

Mutational restructuring brought about by interplanetary discharges can also lead to detrimental changes. In fact, whether such changes prove to be beneficial or harmful remains reliant on what else might have changed in the environment and how capable those affected would have been in adapting to it. Contrary to what Darwin believed, it is not only those genetic changes which improve the chances of survivability that end up being retained. As David Raup indicated long ago, certain modifications ended up being preserved for no apparent reason.[5] And as David Salkeld noted, if a species is fortunate enough, it may survive and flourish despite any handicaps it might have inherited from its ancestors[6]—or, we might add, through sudden mutational changes.

Take dinosaurs, for instance, seeing as we have said so much about them in the pages of this work. So many bizarre species have come to light that we find ourselves sympathizing with the novelist John Updike when he wondered what on Earth could nature have been thinking of.[7]

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[1] "Instant Evolution," *Science Digest* (July 1982), p. 18.

[2] *Ibid.*

[3] *Ibid.*

[4] A. G. Filler, *The Upright Ape* (Franklin Lakes, New Jersey, 2007), *in toto.*

[5] D. Ingber, *loc. cit.*

[6] D. Salkeld, "Natural Selection and Evolution," *Chronology and Catastrophism Review*, XVI (1994), p. 35.

[7] J. Updike & P. Gwin, "Extreme Dinosaurs," *National Geographic* (December 2007), p. 38.

Nor is Updike the only person to question the evolutionary advantage that some appendages supposedly endowed dinosaurs with. As Peter Gwin noted, the double row of spines that composed the body-long crest which adorned the giant *Amargasaurus* "would have offered limited defense at best against predators."[1] Or take the "grossly oversized hands" with strange elongated fingers that belonged to *Epidendrosaurus* which, if we exclude birds, happens to be the smallest dinosaur yet found. "What was it doing with its disproportionate hands, with third fingers longer than the other two digits combined?" asked Gwin.[2]

> "Throughout [the dinosaurs'] long day on Earth [wrote Updike], there was an intensification of boniness and spikiness, as if the struggle for survival became grimmer. And yet the defensive or attacking advantage of skull frills and back plates is not self-evident. The solid-domed skull of *Pachycephalosaurus*, the largest of the bone-headed dinosaurs, seems made for butting—but for butting what?...Butting matches amid males of the same species were unlikely, since the bone, though ten inches thick, was not shock-absorbent."[3]

And what, he further asked, "do we make of such apparently inutile extremes of morphology as the elaborate skull frills of ceratopsians like *Styracosaurus* or the horizontally protruding front teeth of *Masiakasaurus knopfleri*?"[4] Or take *Stegosaurus* who "carried on its back a double row of huge bony plates negligible as defensive armor and problematic as heat controls."[5]

Hans-Dieter Sues offers a different opinion. "These extreme traits just didn't suddenly appear," he claims. "There were compelling reasons why they were selected and pushed down the evolutionary line."[6] But what compelling reasons could there have been behind the appearance of unnecessary bodily appendages? Besides, had such novel changes been really "selected" and "pushed down the evolutionary line," where can the earlier, less evolved, signs of them be hiding? On the contrary it seems that, just as often, once useful traits degenerated into worthlessness. Take the ridiculously tiny arms of *Tyrannosaurus rex*, the usefulness of which Updike also questioned.[7] They were neither good for grasping nor for clawing in defense. These laughable appendages were not the original endowments that encumbered this otherwise enormous beast, but ones that obviously deteriorated from a former pair of prominent and more efficient limbs. But why would they have declined to the point of uselessness? Is it believable that, despite the beast's massive thighs, powerful jaws, and lethal teeth, it had so little use for arms and claws that it simply stopped using them, allowing them to degenerate through succeeding generations? Or were they reduced to useless stumps in one mutational swoop?

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[1] *Ibid.*, p. 34.
[2] *Ibid.*, p. 55.
[3] *Ibid.*, p. 39.
[4] *Ibid.*, p. 38.
[5] *Ibid.*, p. 40.
[6] *Ibid.*, p. 56.
[7] *Ibid.*, p. 40.

And, in case one asks, dinosaurs were not the only terrestrial denizens that were burdened with such superfluous biological attachments. As Updike also pointed out, "odd too" are an elephant's trunk, an elk's antler growth, and a peacock's tail.[1]

Fair enough, one can claim that an elephant's trunk is extremely useful when it comes to grasping and sucking up water; an elk's antlers are handy in grappling similarly-equipped males in the struggle for herd dominance; while a peacock's tail is a magnificent adornment with which to titillate the less endowed, but much desired, females. And yet, as an in-depth study of the subject will reveal, none of these traits could have risen in response to the functions they eventually led to.

Was the long neck of the giraffe developed in order to reach the high foliage it feeds on, or does it now feed on such high foliage *because* of its long neck? Other animals in the same region survive just as well without such long appendages. And then, what sort of foliage could the shorter, but still long, necks enable llamas and their kin to chew on that wild goats in the same area cannot reach? Grace aside, what does their long necks enable swans to accomplish that the shorter-necked ducks cannot? Would not ostriches and their ilk have survived just as well with shorter necks? Despite the retention of their close-to-useless flapping wings, their loss of flight does not seem to have hindered these long-legged birds. What advantage did the unique spiral curvature of their tusks bestow on the Arctic's hairy mammoths? With their pointed ends curving inward, they were neither good for digging nor of use as a weapon. Or what of the wart hog's likewise inward curling tusks which are also useless when it comes to digging and more so in goring their would-be adversaries? What use is the elephant-seal's flexible proboscis? All it does is get in the way when feeding. I could go on, but I believe I've made my point.

Contrary to what Sues claims, the evidence we have accumulated leads us to believe that "these extreme traits," as well as others, *did* appear suddenly while some deteriorated just as fast. They did so due to the mutational effect that extraterrestrial radiation imposed on life during events of drastic cosmic catastrophism. In keeping with Raup's conviction, once inflicted, some of these changes were retained because, while not advantageous, neither were they detrimental. As Updike himself observed, "biological features" need not "be efficient to be carried along."[2]

Here on Earth, cosmic radiation would have been the natural fall-out of interplanetary discharges. The most powerful of such discharges would have occurred during those sub-stellar flare-ups that the proto-Saturnian sun was wont to undergo periodically. And these sub-stellar outbursts have only ended since the proto-Saturnian system joined the retinue of our present Sun, give or take, some ten thousand years ago.

Now it so happens that, when it comes to the astronomical interpretation of the mytho-historical record on which the main thesis of this work was originally based,[3] it is this very entry of the proto-Saturnian system into the Sun's domain of influence that has raised the most objections. And, while I will not mention names, the most critical of these objections

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[1] *Ibid.*, p. 38.

[2] *Ibid.*, p. 40.

[3] *God Star, in toto.*

have come from some of my own colleagues. So let us then, in closing this work, take a closer look at this particular postulate of ours.

OUR CHAOTIC NEIGHBORHOOD

If the conclusions that resulted from Jacques Laskar's investigation of the Solar System's long-term stability that he conducted for the Parisian-based Bureau des Longitudes have any validity, it will turn out that the Sun's original planetary family had been much more numerous than it is at present. For one thing, calculations conducted with high-speed computers have indicated that the Solar System is only marginally stable—"dangerously close to instability," actually[1]—and that "its detailed behavior is fundamentally unpredictable over long time periods."[2] Very much like the old aphorism which claims that a change of weather in North America can be attributed to the fluttering of a butterfly's wings in China, the most trivial of disturbances in a system like ours could, in time, profoundly change its very configuration.[3] From this and other deduced characteristics, Laskar concluded that the Solar System had to have been close to the edge of instability at every stage of its evolutionary process. And, in order to have maintained its marginal stability until the present, the System must have been eliminating bodies "on a timescale comparable with its age at every epoch." From which it follows that the Sun's family "may have contained more planets than it does now."[4]

The above might therefore seem to fly in the face of our scenario, because if proto-Saturn really infiltrated the Solar System, it would have increased, rather than lessened, the Sun's planetary family. Laskar's conclusions, however, are based on the orbital retrocalculation of the planets which he believes to have accreted from the Sun's circumstellar disk.[5] That the formation of planets from gas disks is a theory rife with problems need not be re-stressed. As for retrocalculation, Laskar himself has admitted that the eccentricities inherent in planetary orbits make it impossible to calculate the locations of the planets after a hundred million years.[6] But even that safety margin will not save Laskar's conclusions. The retrocalculation of planetary orbits simply does not work.[7] Lynn Rose and Raymond Vaughan actually laid this beast to rest by using the launching of a spacecraft as an example. Retrocalculation of a spacecraft's orbit after launching would show where that spacecraft would have been located in outer space when it was actually still on its launching pad.[8]

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[1] S. Soter, "Are Planetary Systems Filled to Capacity?" *American Scientist* (September-October 2007), p. 421.

[2] *Ibid.*, p. 414.

[3] *Ibid.*, p. 417.

[4] *Ibid.*, p. 418.

[5] *Ibid.*, pp. 414, 417.

[6] *Ibid.*, p. 417.

[7] See here, for instance, C. L. Ellenberger, "Words in Collision," *Frontiers of Science* IV:1 (March-April 1982), p. 35; W. Mullen, "Catastrophism and the Compulsion to Meaning," *Proceedings of the Symposium held at the Saidye Bronfman Centre* (Montreal, Quebec, Janueary 10-12, 1975), p. 45; P. Warlow, *The Reversing Earth* (London, 1982), p. 183; V. Clube & B. Napier, *The Cosmic Serpent* (London, 1982), p. 73; J. Abery, "Monitor," *Chronology & Catastrophism Workshop* (1994:1), p. 24; *New Scientist* (March 19, 1994), pp. 32-35.

[8] L. E. Rose & R. C. Vaughan, "The Venus Tablets: A Fresh Approach,' *KRONOS* X:2 (Winter 1985), p. 11.

The idea that planets can be flung out of systems is not entirely new. In fact, it has been theorized that free-floating planets "could be the most plentiful objects in our galaxy."[1] Some of these free-floaters had for long been surmised to have been banished from their stellar hosts' environment. But the reverse has also now been postulated. Similar to what we have claimed in this work and its two prequels concerning the proto-Saturnian system, it is now believed that some of these "intriguing objects...may be captured into orbit around stars and create planetary systems indistinguishable from true solar systems."[2]

Planets, to say nothing of brown dwarfs, are not however the only lonesome bodies roaming around in space. Even stars are known to have been ejected from their galaxies. Some stars are actually being flung out of our own Milky Way.[3] One of them is speeding out so fast it has left astronomers in a tizzy.[4]

Yet even then, had the original Solar System contained more planets than it does at present, there is nothing that could have kept stray bodies—and even entire systems—from invading our Sun's domain. The traffic in our galactic neighborhood is actually quite heavy.

There are two vital areas of this neighborhood that bear directly on the matter at hand. One of these is the vastness of the Galaxy itself which is hardly the peaceful system it was once believed to be. It is bad enough that the stars in its bulbous core have been theorized to be orbiting rather furiously around the disk's center. But at the disk's periphery is an additional halo of stars most of which do not behave in an orderly fashion. To make matters even worse, this outer halo has been found to consist of two distinct parts, one of which rotates backwards. And as if that is not already drastic, these two distinct parts overlap one another.[5] We thus end up with an area where stars are orbiting in different directions along each others' paths.[6]

The other vital area is the Solar System's outer fringe, that is the Kuiper belt, which continues to confound those who are presently investigating its vague boundaries. As reported at the end of 2007: "The farthest reaches of our solar system remain the most mysterious areas around the sun."[7] And yet it has become apparent that solving the mysteries of these reaches "could shed light on how the whole thing emerged—as well as how life on earth was born."[8]

The Kuiper belt is home to various objects. As of this writing, one thousand and fifty-five of them have been catalogued. It has been estimated that there must be millions of others waiting to be discovered.[9] Quite a few of these bodies bear the orbital imprint of having been disrupted. Most astronomers actually think that the ensuing disorder was due to a "large massive object that existed in, *or blundered through*, the outer system soon after the planets

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[1] Editorial by D. J. Eicher, *Astronomy* (October 2006), p. 6.

[2] M. R. Zapatero Osorio, "Planets Without Suns," in *ibid.*, p. 44.

[3] D. Mosher, "Speeding Star to Escape from Milky Way," *Space.com* (November 28, 2007).

[4] *Ibid.*

[5] R. R. Britt, "Huge Newfound Part of Milky Way Rotates Backward," *Space.com* (December 12, 2007).

[6] See also A. Thompson, "Milky Way's Halo Loaded with Star Streams," *Space.com* (August 16, 2008);

[7] C. O. Choi, "The Enduring Mysteries of the Outer Solar System," *Space.com* (December 31, 2007).

[8] *Ibid.*

[9] M. Littmann, "Dark Beasts of the Trans-Neptunian Zoo," *Sky & Telescope* (November 2007), p. 26.

were formed."[1] Some have stated outright that these bodies "owe their [distressed] orbits to a visit by another star."[2]

> "An intruder star, leisurely cruising past...would disrupt the orbits of planetesimals more than 50 a.u. from the Sun and scatter them in all directions...the passing star may have [even] carried away a few million of our planetesimals in the process—and dropped off some of its own."[3]

Apart from the remote time when this is said to have transpired, and as far as our unfolding scenario is concerned, the passing star in question could just as easily have been the proto-Saturnian sun—which we believe it was. As it happens, Phoebe, Saturn's outermost satellite (see page 240) has been conjectured to be one of these captured Kuiper belt objects.[4] And if Phoebe, why not others?

Such rogue stars are now known to be quite common. In fact, these wayward objects are said to be giving astronomers "a glimpse into the volatile nature" of our Galaxy.[5] Most, but not all, are hurtling away from us. Some believe these stars have been flung out by the powerful forces of the massive black hole said to reside at the Galaxy's center.[6] But, as it has been readily admitted, these rogues contradict the very existence of such a hole since the hole's violent tidal forces preclude the formation of any nearby stars for it to fling out.[7] Besides, due to its trajectory, one particular rogue, dubbed HE 0437-5439, has now been claimed to be "an alien passerby" which was tossed out from one of our galactic neighbors. And, to be sure, this particular neighbor, the Large Magellanic Cloud, is not believed to harbor a black hole at its center that could have ejected our "alien passerby." As Alceste Bonanos of the Carnegie Institution for Science announced, this "alien passerby" might be hinting at something important.[8]

The Large Magellanic Cloud, together with its smaller companion, the Small Magellanic Cloud, had long been thought to be the Milky Way's longtime companions. Newer studies have now revealed that they are actually newcomers that just happen to be passing by.[9] What, then, if either one of them had been heading directly at us? With the vast distances that separate cosmic bodies, it is doubtful that physical collisions would occur. The probability is that the two galaxies would eventually merge into one. Exchange of planetary bodies between stars would be bound to occur, and free-floating strays like the proto-Saturnian system could easily be adopted by stellar hosts whose systems would either not be filled to capacity or otherwise diminished through previously lost members.

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[1] *Ibid.*, pp. 28-29 (emphasis added).

[2] *Ibid.*, p. 29.

[3] *Ibid.*

[4] *Ibid.*, p. 27.

[5] A. Thompson, "Rogue Stars: The Miscreants of Our Galaxy," *Space.com* (January 29, 2008).

[6] *Ibid.*

[7] *Ibid.*

[8] *Ibid.*

[9] J. Bryner, "Milky Way Companions Just Passing Through," *Space.com* (September 18, 2007).

Too far fetched? As it happens, the leading arm of the Large Magellanic Cloud is now known to be hooking itself onto our Galaxy. Nor is it the only such hook since a similar one is also linking up with us from the Small Magellanic Cloud, bringing all three galaxies closer together. Rather than zooming past us, these two smaller galaxies will eventually merge with our own Milky Way.[1] If this turns out to be so, it becomes quite evident that, despite those stars which are being tossed out, others are also moving into the outer regions of our Galaxy.

At this point I wish I could say that *that* is all the foreign traffic that careens in and out of our Galaxy, but, as the following section will indicate, the flood of alien visitors is much more heavy and complicated than that.

STRANGERS IN A FOREIGN GALAXY

An entire galaxy, now named Sagittarius, was discovered, almost accidentally, by Rodrigo Ibata while still a graduate student at Cambridge University in 1994. Despite the fact that Sagittarius is a significant satellite of the Milky Way, no one had noticed it before. This is because most of its stars are obscured from view in visible light and can only be detected by instruments sensitive to infrared. Detection was made even more difficult since, as mentioned at the beginning of this volume (see page 8), the stars of Sagittarius are now actually mixed with those of our own Galaxy. Ibata discovered this new galaxy when the stellar spectra he was collecting at the Anglo-Australian Telescope in Australia revealed a bevy of red stars that were moving together as a whole against the background of the Milky Way.[2]

> "If people had infrared-sensitive eyes [Steven Majewski from the University of Virginia reported], the entrails of Sagittarius would be a prominent fixture sweeping across the sky. But at human, visual wavelengths, they become buried among countless intervening stars and obscuring dust."[3]

Sagittarius and our Galaxy are even now merging with one another.[4] Moving almost perpendicular to the Milky Way's ecliptic plane,[5] the foreign galaxy seems to be cutting straight through ours. Or, as others would have it, thousands of stars from Sagittarius, which is already a mere vestige of its former self, are being cannibalized *by* the bullying Milky Way.

> "After slow, continuous gnawing by the Milky Way [said Martin Weinberg from the University of Massachusetts], Sagittarius has been whittled down to the point that it cannot hold itself together much longer. We are seeing Sagittarius at the very end of its life as an intact system."[6]

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[1] *Idem*, "Cosmic Finger Taps Our Galaxy's Shoulder," *Space.com* (February 5, 2008).

[2] R. Jayawardhana, "How the Milky Way Devours its Neighbors," *Astronomy* (March 2008 Special Issue—"All About Galaxies"), p. 36.

[3] R. R. Britt, "Detailed Look at Milky Way Gobbling a Galaxy," *Space.com* (September 24, 2003).

[4] J. Roth, "Sagittarius Dwarf Galaxy Spans the Sky," *Sky & Telescope* (December 2003), p. 25.

[5] R. Jayawardhana, *loc. cit.*

[6] R. R. Britt, *loc. cit.*.

In the meantime, entire star clusters that are now in the Milky Way's outer regions have actually been stolen from the Sagittarius galaxy.[1]

> "Ibata's team and others argue that several globular clusters previously thought to belong to our galaxy actually came from the Sagittarius dwarf. Other stolen clusters and individual stars may exist, but they're already so well mixed in with the Milky Way's own that astronomers can't trace their origins."[2]

What is more important to our study is that Sagittarius is slicing the Milky Way through the very region which harbors our Solar System. "Remarkably, stars from Sagittarius are now raining down onto our present position in the Milky Way," Majewski reported further. "Stars from an alien galaxy are relatively near us."[3]

Various hyped media channels that reported this event went one step further in claiming that our Solar System actually belongs to the Sagittarius galaxy rather than the Milky Way. This raised quite a hullabaloo among those involved in the study, who then had to stress that none of them had ever claimed as much. All of which forced certain online publications to retract previous reports and apologize to their readers.[4]

Even so, there are certain matters that should be kept in mind. For one thing, it has always seemed somewhat odd to many observers that the Milky Way is at an oblique tilt when compared to the Solar System's plane of the ecliptic. As viewed from Earth, the Milky Way angles acutely across the darkened sky. Astrophysicists will of course tell us that planetary systems do not necessarily have to align their ecliptic planes with those of the galaxies they inhabit. On the other hand, such oblique axes, which is what tilted planes amount to, are usually attributed, by astrophysicists themselves, to collisions or other catastrophic interactions—as notice the case with the ninety-eight degree tilt of the planet Uranus and its satellites.[5] Additional to that is the recent discovery that the Solar System is hurtling through space at a near-perpendicular angle to the plane of the Milky Way.[6] "It's almost like we're sailing through the galaxy sideways," Merav Opher, from the George Mason University in Virginia, reported.[7] And, as it happens, the Sagittarius galaxy is not only cutting through the Milky Way through the very area occupied by our Solar System, but, judging by the pictorial simulations that have so far been published, and as already noted, it is doing so at right angles to it. All of which implies that the Solar System is much better aligned with the ecliptic plane of the Sagittarius galaxy. Does not this additionally suggest that the Solar System really belongs to Sagittarius? The question is: Has Earth always done so?

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[1] *Ibid.*

[2] R. Jayawardhana, *op. cit.*, p. 37.

[3] *Ibid.*

[4] See here, for example, the Editor's note to "New Map of the Milky Way Shows Our Galaxy to be a Cannibal," *The Bleeping Herald*, published by *Global Intelligent Press*, in the October 4, 2007 issue at http://www.bleepingherald.com.

[5] R. Gore, "The Planets: Between Fire and Ice," *National Geographic* (January 1985), p. 49; D. Overbye, "Voyager Was on Target Again," *Discover* (April 1986), pp. 76, 82

[6] K. Than, "Solar System Sails Sideways Through Milky Way," *Space.com* (May 15, 2007).

[7] *Ibid.*

At this point we must also take note of Halton Arp's belief, and that of others, that spatial vistas of what sometimes appear to be colliding star systems are actually the misinterpreted signs of birthing galaxies.[1] This might leave some wondering whether the Sagittarius galaxy is actually being ejected by the Milky Way rather than colliding with it. But, still according to Arp, galaxies are ejected from older galaxies either laterally or axially.[2] Neither of these methods of ejection seem to fit our case since Sagittarius is presently wrapping itself vertically around the outer limits of the Milky Way. But even if it will turn out that Sagittarius is in fact the Milky Way's offspring, it would not negate the possibility that our Solar System does indeed belong to it.

With all of these stellar systems presently merging with one another, with their stars brushing past each other in opposite directions, is it really all that incredible that our world, together with its previous brown dwarf star, had itself been an alien visitor that was captured by our present stellar host? Besides, do we not have our ancestors' testimony concerning their first glimpse of the Sun that presently bathes our world? Did they not have it recorded that when the Sun first showed itself it appeared no bigger than a star? Did they not realize that it appeared so small because it was still far off? Did they not witness the star-like Sun growing bigger as time went by? And were they not aware that this slow growth was the result of the Sun's slow approach?[3]

Ray Jayawardhana was right on the mark when he claimed that our Galaxy—and he might just as well have stressed our Solar System—has clearly had a colorful, if not dramatic, history. "But the story is far from complete," he added. "The challenge for astronomers will be to weave it together from a million pieces scattered in space and time."[4] And, regardless of the real number of scattered pieces that need to be brought together, that is precisely what we ourselves have been attempting to accomplish.

The only issue that remains somewhat unclear concerns the exact cause of proto-Saturn's recurrent flare-ups. As indicated in our previous volume, proto-Saturn's flare at the end of the Pleistocene was due to its plasmaspheric contact with the Sun's heliosphere. But what was it that caused it to flare up on so many previous occasions, enough to account for each and every one of Earth's past catastrophic breaks?

As also noted in our previous volume,[5] brown dwarfs have a tendency to flare up.[6] More than one reason has so far been supplied to explain these events,[1] even though some of these

[1] H. Arp, *Quasars, Redshifts and Controversies* (Berkeley, California, 1987), pp. 134, 140, , 152, 154, 160, 183; *idem.*, *Seeing Red* (Montreal, 1998), pp. 7, 17, 43, 84, 87-89, 105, 110, 118-119, 215, 230.

[2] *Ibid.* (in both the above).

[3] H. H. Bancroft, *The Native Races of the Pacific States*, Vol. III (London), p. 149; H. S. Bellamy, *Moons, Myths and Man* (London, 1936/1949), p. 244; *idem, In the Beginning God* (London, 1945), p. 120; R. Van Over, *Sun Songs: Creation Myths from Around the World* (N. Y., 1980), p. 36.

[4] J. Jayawardhana, *op. cit.*, p. 39.

[5] *Flare Star*, pp. 333-335.

[6] M. Weinstock, "Powerful Flare from Brown Dwarf Shocks Scientists," *Space.com* (July 12, 2000); R. R. Britt, "Brown Dwarf Emits Strong Radio Flare, Muddling Definitions," *Space.com* (March 14, 2001); T. Lougheed, "Dying Star a Threat to Life on Earth, Researcher Says," *The Vancouver Sun* (May 24, 2002), p. A11;

elucidations have been questioned by the very same authorities who first offered them.[2] And although it has not yet been ascertained one way or the other, there is the possibility that these occurrences are due to some intrinsic properties within the dwarfs themselves.

It must, however, be pointed out, as Wallace Thornhill has more than once stressed, that stellar and sub-stellar flares are best explained through a change in the electrical charge of the bodies in question which can be brought about through more than one possibility. As already indicated, one of these would entail the passage of such a body from one plasma cell into another, which would involve a change in electrical potential. Frederic Jueneman, on the other hand, very much doubts that a sub-stellar body like proto-Saturn would have been able to traverse through different plasma cells within its given galactic life time.[3]

In the meantime, despite our previous admonition that proto-Saturn's entry into the Solar System could only have transpired once,[4] there is still the possibility that its plasmasphere could have brushed against the Sun's heliosphere time and again through what Jueneman has referred to as a "wide-ranging orbital ephemeris *before final capture*,"[5] which Thornhill had also earlier suggested.[6]

But while the above seems somewhat possible in view of the Sagittarius galaxy's interaction with our own, it will not account for the outbursts experienced by all those other stellar dwarfs roaming solitarily through interstellar space. In that respect, the crossing of these bodies from one plasmatic cell into another of different electrical potential seems best to fit the bill. The clashing of such plasma sheaths would then also be in keeping with proto-Saturn's plasmaspheric contact with the Sun's heliospheric shell.

While the actual mechanism responsible for these discharges might be more complex than any of the above theories intimate, there is no doubt in this writer's mind that a sub-stellar flare was generated by proto-Saturn's entry into our present Sun's electrical domain of influence, and that this discharge was the cause of the terrestrial catastrophes associated with the end of the Pleistocene.[7] What we so far have left unsaid is that Earth was not alone in suffering this adversity. Heaven, too, was forced to undergo tremendous changes. Mankind's solitary deity had roused himself from his age-old slumber. Having had union with himself,[8] concurrent with his emission of blinding light,[9] God gave birth to a daughter. But that entails a complex sequence of events that is reserved for the next volume in this series.

Stick around.

J. Roth, "Calibrating Dwarf Novae," *Sky & Telescope* (September 2003), p. 20."Astronomers Find Jupiter-Like Weather on Brown Dwarfs," *Science Daily* [electronic] *Magazine* (May 27, 2002), p. 1.

[1] See, for instance, *ibid.*; W. Liller, "The Story of AM Herculis," *Sky & Telescope* (May 1977), pp. 350-354.

[2] M. Weinstock, *loc. cit.*; see also J. Glanz, "Surprise in the Heavens as Energy is detected in a Brown Dwarf," *New York Times* (February 21, 2001).

[3] F. B. Jueneman to D. Cardona, private e-mail communication, July 25, 2008.

[4] *Flare Star*, p. 513.

[5] F. B. Jueneman to D. Cardona, private e-mail communication, July 26, 2008 (emphasis added).

[6] W. Thornhill, "The Electric Saturnian System," *AEON* VI:1 (February 2001), p. 39.

[7] *Flare Star, in toto.*

[8] *Ibid.*, pp. 279-280.

[9] *Ibid.*, pp. 287 ff.

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ABOUT THE AUTHOR

Dwardu Cardona was born, raised, and educated in Malta, Europe, from where he emigrated to Canada in 1959. Less than a year later, in mid-1960, he became involved in the study of catastrophism and the reconstruction of the Solar System's cosmic history. He has since then acted as a Contributing Editor for *KRONOS* (1975-1978) and, later, as a Senior Editor for the same periodical (1979-1988) and, later still as the Editor for *AEON* (1995-2006). He was a Founding Father of the Canadian Society for Interdisciplinary Studies (now defunct), and has acted as a consultant on mythology and cosmogony for *Chronology and Catastrophism Review*, which is the official organ of the British-based Society for Interdisciplinary Studies. He has also acted as the Series Editor for the *Osiris Series* of books sponsored by Cosmos & Chronos.

As a writer, Cardona has now published well over a hundred articles in various periodicals, most of them on the subjects covered in his present series of books. He has additionally lectured at the University of Bergamo, in Italy, and at various organizations in Canada, the United States, and England. He is the author of two previous volumes, *God Star* and *Flare Star*, which actually form the prequels to the present work.

Cardona presently makes his home, together with his wife, in Vancouver, British Columbia, Canada.

Astrophysicists have noted various problems with the formation of planets out of circumstellar disks, but mainstream scientists continue to promulgate such creations as if the problems do not exist.

The derivation of terrestrial life required a much greater amount of ultraviolet radiation than the Sun presently supplies. And yet the Sun is claimed to have been much dimmer at the very time life rose on Earth.

The emergence of life also required vast electrical discharges, but the electric energy that Earth can produce through atmospheric lightning lacks the required potency to accomplish what is needed.

Life evolved into ever larger forms until evolution outdid itself in the age of dinosaurs. But the present force of gravity is much too strong to have enabled the existence of such colossal beasts.

Moreover, while the extinction of these giants has by and large been blamed on a cosmic impact of some sort, evidence from geology does not tally with this scheme.

The manner in which miles-deep glaciers accumulated during Earth's past ice ages has never been resolved. Nor has an adequate explanation ever been offered to account for the disparity in glacial melting that occurred between the Arctic and Antarctic regions.

Various theories have been proposed in an effort to get to the bottom of the above conundrums, but their sheer number, to say nothing of the contradictions they end up piling on each other, tends to hurl them all into a veritable gladiatorial arena from which none of them has so far escaped unscathed.

Following on the heels of its two prequels,* and in keeping with Occam's razor, what the present work proposes is a unifying theme that not only resolves each and every one of the above mysteries, but quite a few related ones.

At the bottom of it all is the growing realization among astronomers that our Solar System could not have originated as the self-sustained family of planets it presently is, but that some of the Sun's children were actually adopted. And while it was never by any means an orphaned world, one of those adopted children was our own mother Earth.

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